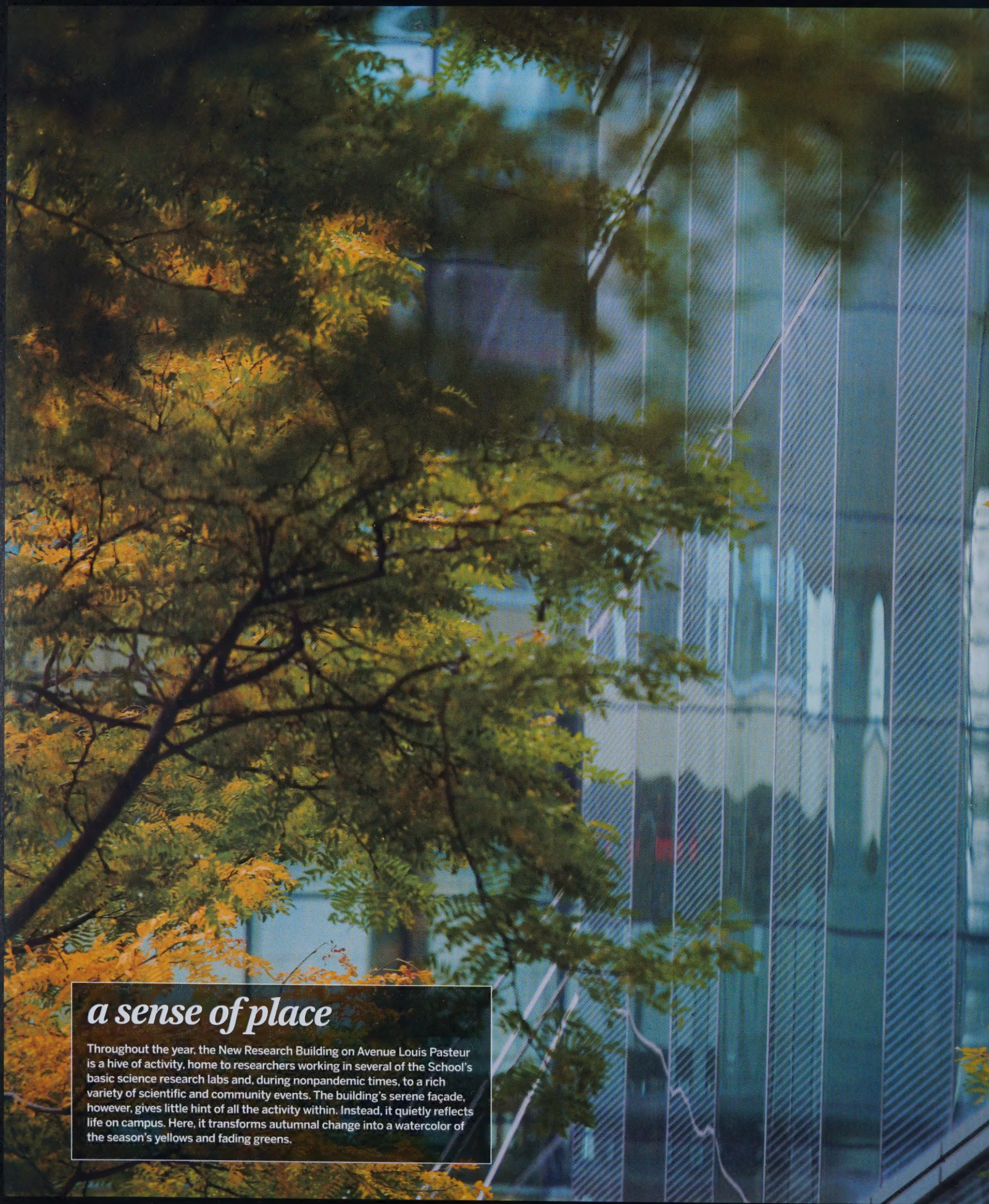
HARVARD

medicine

WINTER 2021

Confronting Racism in Medicine



a sense of place

Throughout the year, the New Research Building on Avenue Louis Pasteur is a hive of activity, home to researchers working in several of the School's basic science research labs and, during nonpandemic times, to a rich variety of scientific and community events. The building's serene façade, however, gives little hint of all the activity within. Instead, it quietly reflects life on campus. Here, it transforms autumnal change into a watercolor of the season's yellows and fading greens.

HARVARD MEDICINE WINTER 2021

GRETCHEN ERTL

p. 42

PEDAL POWER: An extracurricular schedule that includes mentoring, serving as a resident advisor in the student dorm, and working in Boston-area community clinics keeps Sarah Ahmed, an MD candidate at HMS, on the move.

COVER: JOHN SOARES; KELLY DAVIDSON

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We must all work for systemic change in medicine

LIKE SO MANY MILLIONS THROUGHOUT THE WORLD, I was appalled and sickened by the killing of George Floyd. It was a vile act that made the scourge of racism in this country evident to all people of conscience. In its aftermath, thousands have raised their voices to demand accountability and change in the many institutions of this nation that intentionally or unintentionally perpetuate racism and societal injustice.

Harvard Medical School has not been immune to these calls and is acting to effect changes that will set us on a course to challenge and eradicate racism in our community and our profession. We hope that our changes will aggregate with those of others to bring real healing to our nation.

In June, Dean for Medical Education Edward Hundert, MD '84, commissioned the Program in Medical Education's Task Force to Address Racism and named Andrea Reid, MD '88, associate dean for student and multicultural affairs for PME and director of the Office of Recruitment and Multicultural Affairs, and Fidencio Saldaña, MD '01, dean for students, as co-chairs. Charged with making an in-depth internal analysis of all aspects of PME, the group has formed subcommittees now working to identify where racism lives in the PME experience, incorporate anti-racism education into the curriculum, develop concrete action plans to combat racism in PME, and, most importantly, develop a monitoring and reporting structure to address racist actions in real time going forward. We expect draft recommendations in February 2021.

Members of these groups are committed to revealing hard truths and making bold recommendations. It is my hope that their work will complement moves to analyze and develop anti-racism recommendations for other parts of our community, including staff development, faculty diversity, and the graduate student experience. Our approach to this review exemplifies how we achieve continuous quality improvement across HMS: Whether in research, education, or clinic, we engage in critical inquiry, investigation, and analysis, followed by definitive action. That's how science advances, and it's how medicine and medical education change.

All of us must work for systemic change. Those of us who do not navigate daily life as a person of color must be aware and mindful of the emotional and physiological toll that overt and covert racism takes on our colleagues, trainees, students, and patients. It is essential to learn how to become the best ally possible. We all know that the changes we need to make to express our better angels cannot be defined only in rules, recommendations, or laws. They must be lived.

The work ahead will be challenging. The road to even the smallest milestone is steep and often will require us to extend one another a helping hand. We are beginning this work at HMS—and we know there will be no end. We are members of a profession that has continually bettered itself by looking inward, by striving to see things anew, and by making changes so that we might always fulfill our pledge to not only do no harm but also to improve health and well-being for all.

George Q. Daley
Dean of Harvard Medical School

HARVARD
medicine

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RANDY GLASS

To look anew

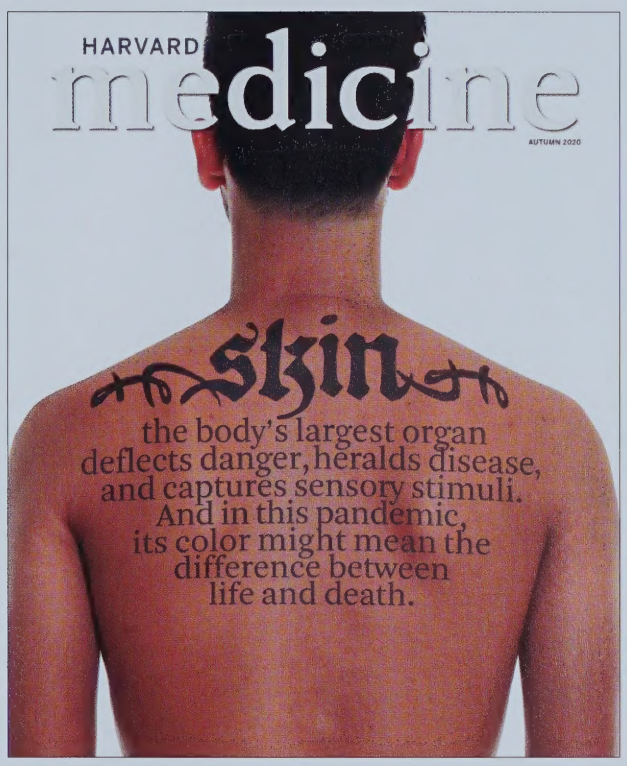
As an alum of both HMS and the Harvard Combined Dermatology Program, I was gratified to see the Autumn 2020 issue of *Harvard Medicine* give our largest organ the attention it deserves. In addition, the tying in of chemistry (James C. White, MD 1856, first professor of dermatology and a chemist), skin color, and care of the homeless is a natural fit in more ways than one.

Gentian violet, the use of which was pioneered in part by Robert Henry Aldrich of the Harvard Surgical Teaching Service for treatment of severe burns in the 1930s, continues to find valuable use in dermatology. Our laboratory has found that this old medication inhibits NADPH oxidase and, thus, has novel anti-inflammatory and antitumor properties. Gentian violet is an inexpensive, over-the-counter medication that we have found useful in clinical practice for the treatment of common skin disorders, including eczema, blistering disorders, pyodermas, onychomycosis, and venous ulcers. Because it is not costly and is easily procured, this repurposed drug could be used by primary care physicians to treat many skin disorders. It should also be a mandatory part of the toolkit to treat the homeless, who are particularly prone to skin infection and inflammation. Furthermore, gentian violet is emerging as a treatment for cutaneous T-cell lymphoma, a malignancy that is increasing in incidence among people of color.

JACK ARBISER, MD '91 PhD '91
ATLANTA, GEORGIA

Illuminating the field

I read with interest the article "Attuned to the Signs of Trouble" in the Autumn 2020 issue of *Harvard Medicine*, particularly because it underlined both the importance of the skin as a window to disease within the body and the frequent lack of adequate training in dermatology in medical education. But it was this sentence in particular that prompted my letter: "Medical textbooks and online guides have not always included darker skin tones in their photographs and descriptions."



As it happens, my partner, Ali Moiin, an active dermatologist in the Metro Detroit area, recently published the *Atlas of Black Skin* (Springer 2020) based on his experience with the diverse patient population in our city. It is our hope that this atlas will help provide more exposure for students and practitioners. I hope that your article will similarly encourage more activity in this area of dermatology and, perhaps, in other similarly underrepresented areas.

I also applaud this magazine's coverage of issues in medical education. I am a pathologist in the subspecialty area of neuropathology, and I have been involved in medical student and resident education for my entire career.

Thank you for your consistently interesting articles.

WILLIAM KUPSKY, MD '78
DETROIT, MICHIGAN

Missives and medicine

I want to express my appreciation to Sachin Jain for his article "Permanent Ink," which appeared more than a year ago in the Autumn 2019 issue of *Harvard Medicine*.

I, too, have a box of letters from patients and families. I retired from anesthesiology and critical care in 2008 when letter writing still was a common vehicle for the expression of gratitude. No computer files for me.

These letters acknowledge that the physician-patient relationship that I enjoyed so much reflected my broader practice of humanistic medicine, treating and caring for the whole patient: mind, body, spirit, emotions, and will. For me, this therapeutic relationship served as a major resource for managing my stress and avoiding burnout. The letters also serve as a confirmation of the meaning and purpose embedded in my calling.

A further source of appreciation emanating from my relationship with my patients and their families was their remembering me and, at a later time, requesting that I provide care for them, their families, and even their friends.

An unfortunate outcome of the systematic exigencies of the practice of modern medicine has been a relegation of the physician-patient relationship to one of far lesser value. Despite the truism that medicine is the most scientific of the humanities as well as the most humanistic of the sciences, modern medicine has lessened its embrace of the humanities and the social sciences. The gradual disappearance of the art of medicine and the accompanying dehumanization and depersonalization of clinical medicine imply that human beings may be perceived and treated in a manner that does not acknowledge their humanness and identity. Notably, dehumanization also applies to physicians' view of themselves and can contribute to our profession's epidemic of stress, burnout, physical and mental illness, chemical dependence, and suicide.

In this era of cost containment, production pressures, and mandates and regulations, the opportunities for physicians to achieve a humanistic interaction with their

During the 1918 influenza pandemic, Red Cross workers, such as these women in Boston, made and bundled face masks for use by U.S. soldiers.

patients are few in the face of an enlarging complexity of obstacles and challenges. Forgoing the opportunity to serve as healers who provide comfort, empathy, and reassurance while earning trust and confidence can mean the loss of a hallowed medical rite.

In a 2009 article in *Health Affairs*, Stanford professor Abraham Verghese wrote that the physician-patient interaction, "when viewed as ritual, is a reenactment of a healing scene that has played out through recorded history: one individual with expertise, anointed by society … attempts to relieve the suffering of another."

Attention to a cultivation of this human factor must be retained in order for our profession, as we have known it, to survive.

STEPHEN JACKSON, MD '64
MONTE SERENO, CALIFORNIA

Lost, not forgotten

I read with great interest the article on the 1918 influenza pandemic that appeared in the Spring 2020 issue of *Harvard Medicine* magazine, especially the paragraph describing the role that Harvard medical students played during that pandemic: "Fourth-year students suspended their classwork to help look after their peers, around sixty of whom were in the College's Stillman Infirmary …with 'the grip' … By the time the spring semester began, five of the hospitalized students had died. …"

One of those five students was my maternal grandfather's older brother, Allen Hollis Jr. According to a small item that ran in the *Boston Globe*, he died on December 18, 1918, while a patient in the infirmary. For several years, I have been researching the history of the Hollis family during World War I and know that the loss of this young man was a tragic blow to the family. It was good to find information relevant to my search in this article. Thank you.

Although I continue researching my family's history for a book I hope to write, it is hard to learn some of the details from events that took place more than a century ago. I would welcome any information about World War I history at Harvard that readers of your magazine would be willing to share.

KIMBALL LOOMIS
WHITE BEAR LAKE, MINNESOTA
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Furry Friends

THE DEATH OF A BELOVED FAMILY PET CAN TRIGGER a prolonged and profound sense of grief in children, which might result in measurable psychological distress that can serve as an indicator of depression in children and adolescents for three or more years after the loss, according to a study by HMS researchers at Massachusetts General Hospital. The researchers found that the association between exposure to a pet's death and psychopathology symptoms in childhood was more pronounced in males and occurred regardless of socioeconomic status or previously endured hardships. In addition, the strength of the association was independent of when the pet's death occurred, how recently it had occurred, or the frequency of experiencing such a loss.

Crawford KM et al., *European Child & Adolescent Psychiatry*, September 2020

COURTESY OF THE JOHNSON/MENTING FAMILY

GERONTOLOGY

Mobility initiative found to help older adults

IMMOBILITY DURING HOSPITALIZATION contributes to poor patient outcomes, yet many hospitals use bed and chair alarms that discourage mobility as part of their falls prevention programs. This approach confines older adults to their beds throughout their hospital stay, putting them at increased risk of delirium, pressure ulcers, functional decline, and death.

To help counter these deleterious outcomes, HMS researchers at Mount Auburn Hospital, together with the Center for Medicare & Medicaid Innovation, developed a mobility initiative and provided it to more than forty U.S. hospitals participating in CMMI's bundled payment programs. The care delivery model, called the Mobility Action Group Change Package, provided the hospitals with a framework of peer support, expert faculty, and resources designed to create a culture of mobility in the care of hospitalized older adults.

The team reports that 76 percent of participating sites in medical, surgical, and intensive care units successfully implemented mobility programs, with 43 percent of these programs fully implemented and an additional 33 percent partially implemented by the end of the active trial. Fifty-four percent reported a high likelihood that their mobility program would continue long-term. Overall there was a more than twofold increase in the proportion of patients who received at least three walks daily and a nearly twofold reduction in the use of bed or chair alarms across all sites.

The researchers determined that the Mobility Action Group Change Package was an essential tool and starting point for each hospital and that the peer support and assistance the staff at participating hospitals received proved to be key to the success of the trial effort.

Lorgunpai SJ et al., *Journal of the American Geriatrics Society*, August 2020

Health Care Policy

Workplace diversity may lessen gender-linked income inequities

A study by researchers in the Department of Health Care Policy in the Blavatnik Institute at HMS and scientists from Doximity, the RAND Corporation, and the University of California, Berkeley, provides evidence that workplace diversity can help reduce gender-linked income inequities. In the researchers' analysis of nearly ten thousand nonsurgical group practices, those with roughly equal numbers of female and male physicians had a 12 percent relative difference in income, while male-dominated nonsurgical practices had a 20 percent relative difference.

Whaley CM et al., *BMJ*, July 2020

CLINICAL MEDICINE

Test shows risk for serious illness, death from virus

A STANDARD TEST THAT MEASURES variation in the volume of red blood cells can identify hospitalized patients with COVID-19 who are at high risk for becoming critically ill and dying from the disease, according to research by a team of HMS investigators at Massachusetts General Hospital.

The findings are based on the team's retrospective analysis of blood samples and medical records from more than 1,600 adults diagnosed with SARS-CoV-2 infection and admitted to a Boston-area hospital in March and April 2020.

The test, known as red blood cell distribution width, or RDW, is part of the complete blood count profile routinely used by physicians to screen, diagnose, and monitor a variety of conditions.

In the current study, the researchers found that variations in RDW above normal range indicated a higher mortality risk among those hospitalized for COVID-19. Patients who had RDW values above the normal range when they were admitted to the hospital had a mortality rate of 31 percent compared with a rate of 11 percent in patients with normal RDW values when admitted.

In addition, an increase in RDW after admission was linked with a heightened risk of dying, indicating that patients' RDW could be tracked during hospitalization to help determine whether they are responding to treatment or getting worse. The link persisted even when the researchers accounted for the possible influence of other factors, including patient age, preexisting conditions, and variations in other laboratory findings.

Foy BH et al., *JAMA Network Open*, September 2020

INFECTIOUS DISEASE

Children may play greater role in COVID-19 spread

IN THE MOST COMPREHENSIVE STUDY of COVID-19 pediatric patients to date, a research team led by HMS scientists at Massachusetts General Hospital has found that children may play a larger role in the community spread of COVID-19 than previously thought.

The researchers found that infected children, even those with mild or no symptoms, carried high levels of the virus in their respiratory secretions, especially in the first two days of symptoms, and that age did not affect the ability to carry high amounts of virus. The higher the level of virus a person carries, known as the viral load, the greater the risk of transmitting the virus to others.

The team found that infected children in the asymptomatic or early infection phase had significantly higher viral loads than hospitalized adults with severe COVID-19. They also found that although younger children had lower levels of ACE2, the receptor protein that SARS-CoV-2 targets to enter human cells, than

HM INDEX: *CDC DATA SHOW THAT EACH YEAR **3** MILLION PEOPLE OVER THE AGE OF **65** ARE TREATED IN EMERGENCY DEPARTMENTS FOR FALL INJURIES.*

Bacteroides fragilis

Inner Defense

RESEARCHERS IN THE Department of Immunology in the Blavatnik Institute at HMS found that action by a molecule on the surface of the gut bacterium *Bacteroides fragilis* helps trigger antiviral immunity. In a mouse model, the team showed that the surface molecule on the bacterium communicates with receptor proteins on immune cells lining the colon. If those receptor proteins detect molecular patterns characteristic of infectious agents, the molecule on *B. fragilis* and other organisms in the microbiome collaborate with the immune cells by activating the TLR4-TRIF signaling pathway, one of the immune-signaling pathways that contribute to innate immunity. Once activated, the immune cells release interferon-beta, a chemical that can trigger the infected cells to self-destruct or rally other classes of immune cells to the fight.

Stefan KL et al., *Cell*, November 2020

older children and adults, the lower levels did not correlate with decreased viral load. According to the researchers, this suggests that children can carry a high viral load, and thus remain contagious, regardless of their susceptibility to developing COVID-19 infection.

For the study, the researchers enrolled 192 participants who were 22 years old or younger and measured viral load and antibody response in three cohorts within each group: healthy children, children with acute SARS-CoV-2 infection, and a smaller number of children with multisystem inflammatory syndrome in children (MIS-C), a multiorgan, systemic infection that can develop in children with COVID-19 several weeks after infection.

Yonker LM et al., *The Journal of Pediatrics*, August 2020

CLINICAL MEDICINE

Clotting factor levels may have role in COVID-19

PATIENTS WHO ARE HOSPITALIZED WITH SEVERE COVID-19 infections and have high levels of the blood-clotting protein factor V are at elevated risk for serious injury from blood clots such as deep vein thrombosis or pulmonary embolism, according to HMS investigators at Massachusetts General Hospital. In addition, patients who are critically ill with COVID-19 and have low levels of factor V appear to be at increased risk for death from a coagulopathy that resembles disseminated intravascular coagulation (DIC), a devastating, often fatal, abnormality in which blood clots form in small vessels throughout the body, leading to an exhaustion of the clotting factors and proteins that control coagulation.

The findings, based on studies of patients with COVID-19 in Mass General intensive care units, indicate that disturbances in factor V activity can be used to identify at-risk patients with the goal of selecting the proper anticoagulation therapy.

In March 2020, the researchers noted that a blood sample from a ventilated patient with COVID-19 contained factor V levels well above the normal reference range. The patient later developed a saddle pulmonary embolism, a potentially fatal blood clot occurring at the junction of the left and right pulmonary arteries.

This observation led investigators to look at the activity of factor V as well as factor VIII and factor X, two other major clotting factors. They studied the levels of these clotting factors and other parameters in 102 consecutive patients with COVID-19 and compared the results with those in contemporaneous critically ill patients without COVID-19, and in historical controls.

They found that, compared with controls, factor V levels were significantly higher among patients with COVID-19 and that the association between high factor V activity and COVID-19 was the strongest among all clinical parameters studied.

In all, 33 percent of patients with factor V activity well above the reference range had either deep vein thrombosis or a pulmonary embolism, compared with only 13 percent of patients with lower levels. Death rates were significantly higher for patients with lower levels of factor V (30 percent vs. 12 percent), with evidence indicating this was due to progression to a DIC-like state.

Stefely J et al., *American Journal of Hematology*, August 2020

GERONTOLOGY

Infection checklist could protect vulnerable elderly

FINDINGS FROM A STUDY BY HMS RESEARCHERS at Hebrew SeniorLife have demonstrated that a cohort of Massachusetts nursing homes showed significant declines in weekly infection and mortality rates among their residents when the facilities adhered to a twenty-eight point infection control checklist and a set of care criteria specifically developed for use by such long-term care institutions.

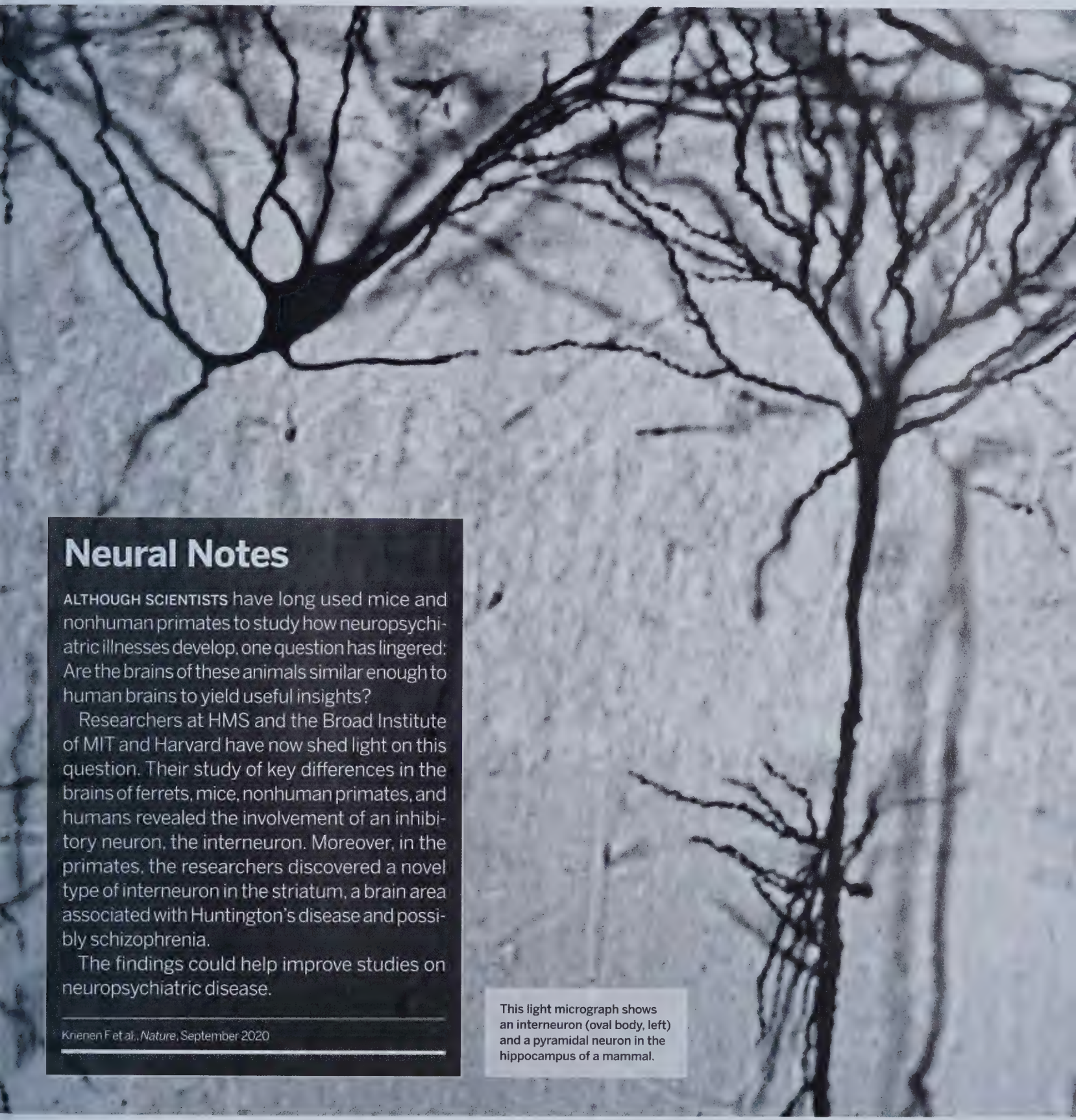
Eighty nursing homes with previous infection control deficiencies and forty-three additional nursing homes that had failed an initial audit by the Massachusetts Executive Office of Health and Human Services were designated as a research cohort and received on-site and virtual consultations on the implementation of the care criteria and infection control checklist.

Items on the checklist included implementing strategies such as grouping residents based on their risk of infection or whether they tested positive for COVID-19; closing congregate spaces; training staff in the donning, wearing, and removal of personal protective equipment (PPE); implementing appropriate infection control policies; and ensuring that staff were trained to recognize and respond to the signs and symptoms of COVID-19.

In addition to the 123 institutions designated to participate in the study, all 360 Massachusetts nursing homes were offered weekly webinars and answers to questions regarding infection control procedures. The Massachusetts Senior Care Association informed facilities of available resources for acquiring PPE and backup staff, and the Massachusetts National Guard was mobilized to provide universal testing.

A review and analysis of the data collected showed both resident and staff infection rates in the designated facilities rapidly declined after the recommended infection control interventions were put in place and ultimately reached the low levels of infection and death seen in other Massachusetts long-term care facilities. According to the study's authors, the program helped long-term care providers increase their knowledge of, and access to, the best infection control practices and reduced the risk of COVID-19 spread among both residents and staff. The program, they add, could serve as a national model.

Lipsitz L et al., *The Journal of the American Geriatrics Society*, September 2020



Neural Notes

ALTHOUGH SCIENTISTS have long used mice and nonhuman primates to study how neuropsychiatric illnesses develop, one question has lingered: Are the brains of these animals similar enough to human brains to yield useful insights?

Researchers at HMS and the Broad Institute of MIT and Harvard have now shed light on this question. Their study of key differences in the brains of ferrets, mice, nonhuman primates, and humans revealed the involvement of an inhibitory neuron, the interneuron. Moreover, in the primates, the researchers discovered a novel type of interneuron in the striatum, a brain area associated with Huntington's disease and possibly schizophrenia.

The findings could help improve studies on neuropsychiatric disease.

Krienen F et al., *Nature*, September 2020

This light micrograph shows an interneuron (oval body, left) and a pyramidal neuron in the hippocampus of a mammal.

Topflight Science

IT WAS JUST SHY OF 3 A.M. ON OCTOBER 7 when Jennifer Doudna's mobile phone lit up. The caller was a reporter whose name she recognized, so she answered. Still groggy with sleep, the Berkeley biochemist listened while the reporter asked for her thoughts on the news about the Nobel Prize in Chemistry win. Doudna, PhD '89, apologized for not having heard who had won and therefore not being able to comment. That was when Doudna learned—from a science reporter for *Nature*—that she and Emmanuelle Charpentier, director of the Max Planck Institute for Infection Biology, had been awarded the 2020 prize for the discovery of a tool for genome editing known as the CRISPR-Cas9 genetic scissors. Their prize is the first in Nobel history to be awarded to a research team made up solely of women.

According to the Nobel committee's statement, CRISPR-Cas9 is one of gene technology's "sharpest tools," for it allows scientists to rewrite the DNA in any cell with surgical precision. In medicine, the tool already has been used to develop new cancer therapies that are now in clinical trials. Perhaps most promising is the potential CRISPR-Cas9 holds for helping to cure inherited diseases.

Following the announcement, there was jubilation in the science community at the University of California, Berkeley, where Doudna is a professor of chemistry and of biochemistry and molecular biology. But there were more than a few cheers at HMS, too.

Doudna undertook her doctoral work in biological chemistry and molecular pharmacology in the School's Biological and Biomedical Sciences Program. She did her dissertation research in the laboratory of Jack Szostak, himself a 2009 Nobel laureate in Physiology or Medicine, where she investigated enzymatic catalysis by ribozymes.

noteworthy

Renamed academic society honors William Augustus Hinton

In September, HMS Dean George Q. Daley, MD '91, announced he had approved a recommendation to rename the Holmes Society to the Hinton Society, in honor of the late William Augustus Hinton, MD 1912, an HMS clinical professor of bacteriology and immunology. The recommendation had been put forward by a task force of the Faculty Council Subcommittee on Artwork and Cultural Representations, which works to ensure that the School's buildings, symbols, academic societies, and public spaces reflect its mission and values.

An internationally recognized infectious disease researcher, Hinton (*fig. 1*) was an HMS faculty member and the first Black full professor at Harvard.

"Dr. Hinton is an eminent former faculty member and alumnus, a pioneering scientist and physician, and an individual abundantly deserving of this recognition," said Daley when announcing the change.

The task force's recommendation was enthusiastically endorsed by Dean for Medical Education Edward Hundert, MD '84. "Dr. Hinton's public health and biomedical advances in the diagnosis of syphilis helped untold numbers of patients," said Hundert, "and his writing on the role that socioeconomic factors play in health outcomes make him as relevant today as when he wrote those seminal works almost a century ago."

The renaming of the academic society comes as part of a multiyear effort at HMS and followed Daley's request to the Faculty Council Subcommittee to create guiding principles to assist the School in making naming choices and to use the guidelines to consider a petition spearheaded by students calling for the Holmes Society name change.

Oliver Wendel Holmes Sr., MD 1836, served as HMS dean from 1846 to 1853. Although historically recognized for his substantial contributions to medical science and education, such as his demonstration of the contagiousness of puerperal fever, in recent years, Holmes has been criticized for his 1850 decision to accede to white students' demands to expel the School's first three admitted Black students, Martin Delany, Daniel Laing Jr., and Isaac Snowden.

New era begins for therapeutic research and education at HMS

In late October, an important milestone for the School's Therapeutics Initiative was marked by the launch of the Ideation Hub (I-Hub) and the Translator program. These initiatives will support efforts by HMS researchers to knit together the translational continuum from idea generation to the development of clinical therapeutics (*fig. 2*).

With the support of a gift from the Blavatnik Family Foundation, the School has invested deeply in therapeutics-oriented programs, research infrastructure, and promising translational projects.

The I-Hub, according to its director, Timothy Mitchison, the Hasib Sabbagh Professor of Systems Biology in the Blavatnik Institute at HMS, is intended to build community and help scientists at all stages of their careers develop ideas and create translational projects. It is convening disease and technology groups, two of which have already been established. One is addressing COVID-19 through an innovative collaboration with the pharmaceutical company AbbVie, while another is addressing the unmet needs of Lyme disease.

Another priority for the I-Hub is education, highlighted by the Therapeutic Innovation Fellows Program, intended to give trainees firsthand experience with drug discovery and development and designed to lead to careers in industry.

"We want to surround the ideas that arise from our community with material support but also with advice and a chance to learn about drug discovery," said Mark Namchuk, executive director of therapeutics translation at HMS and director of the Translator.

The core of the Translator will be its staff, starting with a team of senior therapeutic scientists—industry veterans experienced in the art of drug discovery and development.

fig. 1

fig. 2

fig. 3

These scientists will be closely involved with designing, advising, and advancing HMS therapeutic projects and, by sharing their expertise in developing drugs in industry, will offer a critical educational opportunity for students, postdocs, and faculty.

Center for Computational Biomedicine head begins tenure

On July 13, Robert Gentleman began as the School's founding executive director of the Center for Computational Biomedicine. Gentleman (*fig. 3*), an accomplished statistician and computational scientist with extensive experience in academia and industry, most recently served as vice president of computational biology at the genetic testing company 23andMe.

The recently created Center for Computational Biomedicine is designed to harness and amplify computational and data sciences across HMS and to strengthen the connections between data science efforts at the medical school, across Harvard, at Harvard-affiliated hospitals, and in industry.

In his new role, Gentleman will conceptualize the scientific vision for computational biomedicine across HMS and lead the execution of this vision. He also will bring his decades-long experience in developing software tools, user interfaces, and underlying statistical and computational methods to bear on the center's mission.

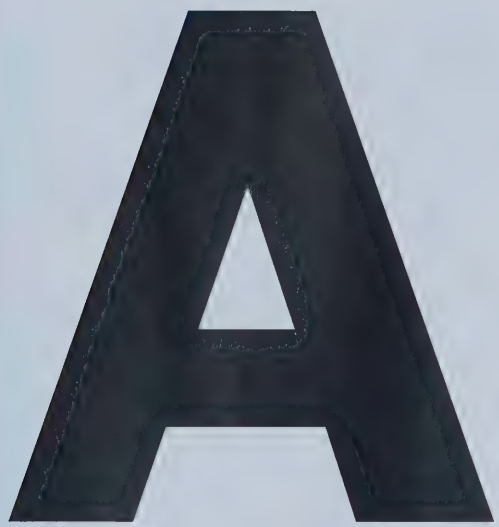
Gentleman joined 23andMe to help launch the company's therapeutics division. There, he built a team of leading computational biologists that developed novel methods for identifying links between genetic loci and possible drug targets.

Gentleman is the co-creator of the programming language R, which is widely used by statisticians and data miners for developing statistical software and data analysis for a range of applications in a variety of disciplines. He is also a founder of the Bioconductor Project, an open-source collaborative software tool designed to promote statistical analysis and comprehension of current and emerging genomic data.

Race-based medicine, deeply embedded in clinical decision making, is being scrutinized and challenged

BY STEPHANIE DUTCHEN

Field Correction



JORI BOLTON

A YOUNG BLACK MAN ARRIVES in the emergency room, doubled over in pain from a sickle cell crisis. "It's an act," says the attending physician dismissively. "I think he just wants drugs." The attending refuses to prescribe the opioids he might give to a white patient in similar straits.

Andrea Reid, MD '88, associate dean for student and multicultural affairs for the Program in Medical Education and director of the Office of Recruitment and Multicultural Affairs at Harvard Medical School, witnessed too many such scenes as a trainee in Boston-area hospitals in the 1980s and '90s.

"It was awful," she says. "There was bias that reflected in the management of some patients, especially those who didn't look like they were in pain." After watching this scenario play out in the emergency department and on the wards, Reid quietly began to direct some of the sickle cell patients toward her outpatient clinic for continuity care.

Studies confirm what Reid and countless other people of color in the United States have known for decades: Black and brown patients are systematically undertreated for pain. When treating pain from broken bones to appendicitis, clinicians—often white clinicians—give darker-skinned patients, including children, lower doses of analgesics than they do white patients, less potent medicines, or nothing at all.

Assuming that a Black or Latino man in pain is a drug user represents race-based discrimination that might be rectified through anti-bias training. The disparity in pain management, however, is also driven by biases that are more insidious because they appear to be based in science.

Many clinicians have heard or been formally taught that Black people don't feel pain as acutely as white people because they have different biology. Black bodies have fewer nerve endings than white bodies, they've been told. Black skin is thicker than white skin, they've learned. Digging deeper reveals that these notions, as old as transatlantic slavery, have no evidence behind them. Yet a 2016 survey in *PNAS* of white medical students and residents found that half of the respondents still believe and act on them.

"These are not remote, historical issues around race-based treatment recommendations," says Reid. "These are contemporary issues, with disturbing articles coming out every year."

Troubled waters

For centuries, race-based medicine in the United States has aimed to identify biological differences between racial groups that could then be used to tailor health care to members of those groups. This has been done at times in bad faith, particularly in past eras, and at other times with good intentions, reflecting earnest attempts to provide better care to historically underserved populations. A growing number of patients, researchers, and clinicians, however, argue that regardless of intent, race-based medicine is simply another form of bias masquerading as evidence-based practice. Scientific meaning can't be derived from race when race is widely acknowledged as a social construct with definitions that vary around the world, they say, and the faulty endeavor too often results in substandard care for patients of color.

"Race medicine is bad medicine," summarized Harvard Law School alumna Dorothy Roberts, a professor of law, sociology, and civil rights at the University of Pennsylvania, in a 2015 TEDMED Talk. "It's poor science, and it's a false interpretation of humanity."

The practice ranges far beyond pain management. Race has become baked in

to the way U.S. clinicians are supposed to assess disease risk, make diagnoses, plan treatments, and gauge outcomes. Tools that attempt to correct for race span at least eight clinical specialties, according to a 2020 roundup in the *New England Journal of Medicine*. On a scale doctors use to determine whether flank pain is likely the result of the presence of a kidney stone, being any race but Black counts as much as having blood in the urine does. Patients identified as American Indian/Alaska Native, Asian American, Black, Hispanic or Latinx, or Native Hawaiian/Pacific Islander are given higher risk values than white patients when assessing the safety of undergoing the most common heart surgeries, on top of concrete risk factors like age and obesity. Race-based "corrections" also seep into electronic health records and machine learning algorithms, where adjustments and the rationales behind them are not always apparent to care providers or patients.

The results of these corrections affect the full spectrum of care, from what medicines and dosages are selected to which patients are granted access to specialists, organ transplants, clinical trials, and insurance coverage.

For the moment, it's largely unclear which race-based medical practices alleviate health disparities and which perpetuate or worsen them. The reasoning can be circular: Black study participants have in the past displayed poorer lung function than white patients, therefore lung function must be naturally lower in Black people, therefore standards related to lung health should be lowered for Black patients and treatment recommendations made accordingly. Those familiar with the history of racial discrimination suspect, and indeed have begun to demonstrate, that patients of color end up being underserved—a double misfortune in cases where race-based medicine is meant to improve quality of care. The lack of clarity can put standards of care at odds with the professional and personal values of clinicians, trainees, and students, especially those of color.

Darshali Vyas, MD '19, an HMS clinical fellow in medicine at Massachusetts General Hospital, has published several commentar-

Andrea Reid

ies on the flaws of race-based decision calculators, including as first author of the 2020 *NEJM* roundup. The impetus to investigate arose from "a tension many of us feel between how we learned about race in medical school as a social construct and how it is used clinically," she wrote on Twitter in June 2020.

Questions about the legitimacy of race-based medicine have cropped up for decades from both within and outside the medical profession. That skepticism has gained steam in the past few years as movements such as Black Lives Matter and Missing and Murdered Indigenous Women have drawn the nation's attention to racial inequities in killings involving police and beyond. Demand is growing to see the data that justify divergent medical practices, old and new.

As sleuths scratch the surface, they're discovering that evidence is often missing, mixed up with other variables, or reliant on racist premises and stereotypes—findings that deeply discomfit some and come as no surprise to others.

"As historians, we trace the footnotes back to see where these practices come from," says David Jones, MD '01, the A. Bernard Ackerman Professor of the Culture of Medicine at Harvard and HMS and co-author with Vyas of the *NEJM* paper. "Sometimes the footnote trail leads back to nineteenth-century scientific racism."

"We need to figure out the ways in which our longstanding history of racism within medicine has obscured our modern-day understanding of race and the role it plays in health and health care," says Troy Amen, a fifth-year MD-MBA student at HMS. "Unless you admit that you may have biases, there's no way to move forward and fix these historical artifacts that pervade the way we teach our students and provide less adequate care to patients."

Assessing race-based medicine entails reaching consensus on what is meant by race and elucidating the factors that race stands for as a rough proxy.

The key, experts say, is to first acknowledge there's a problem. Then more people—clinicians, researchers, social scientists, students, medical educators, institutional leaders, and funding bodies—can join efforts to solve it.

Thoroughly assessing race-based medicine entails reaching consensus on what is meant by race and elucidating the factors that race stands for as a rough proxy. It requires research that sorts biological from social contributors to health and determines how many observed differences in health and disease represent natural traits that track to some extent with what we call race and how many reflect the consequences of living as a particular perceived race in the United States. It calls for raising clinician awareness and encouraging inquiries into where and why race-based clinical decisions are made. And it necessitates changes in medical education.

"Any thoughtful institution at this time should be looking at race-based medicine as an important area of bias," says Reid. "Many medical schools, including HMS, are asking: How did it get into the curriculum, and how do we get it out?"

"Any institution should be looking at race-based medicine as an important area of bias. Many medical schools are asking: How did it get into the curriculum, and how do we get it out?"

False premises

Scholars have documented how modern conceptions of race and racial hierarchies arose alongside the Western enslavement of people from Africa. People invested in white supremacy at the time were known to conveniently discover or outright invent biological differences between newly defined races to justify inhumane treatment. Some of those theories remain embedded in medicine.

Spirometry is an oft-cited example. Diagnosing or monitoring the status of lung conditions such as asthma and chronic obstructive pulmonary disease commonly involves this test, in which a machine measures the force and volume of a patient's exhalations, calculates the lung capacity, and determines whether it's within normal range. The ranges considered normal are adjusted downward for shorter and older people and women, who've been shown to have lower lung capacity than taller and younger people and men of comparable health. Ranges also are lowered for Black, Hispanic, and Asian people.

That's where things get dicey. Lundy Braun, a professor of pathology and laboratory medicine and of Africana studies at Brown University, traced the race correction in spirometry to eighteenth- and nineteenth-century claims that Black people had less lung capacity than white people and that this deficit would benefit from physical labor. The most influential "study," by pro-slavery physician Samuel Cartwright, did not account for the effects of enslavement on Black people's observed lung health. A contemporaneous study finding no difference in lung capacity between Black and white Union Army soldiers failed to gain traction in the medical field.

Recent studies have linked diminished lung capacity with poverty and exposure to pollution, both of which disproportionately occur among people of color because of structural racism. The combination of ingrained ways of thinking and the possible confusing of innate biological differences with disparities in environment, income, education, and access to good food and health care means that today, use of spirometry may be writing off poorer lung health in marginalized populations as normal and


David Jones

contributing to underdiagnosis and insufficient treatment.

"By using these lung function algorithms, are we blinding ourselves (and society) to the health harms of structural racism, effectively normalizing lung damage that Black Americans suffer from dirtier air, dirtier jobs, and substandard medical care?" asked Adam Gaffney, an HMS instructor in medicine at Cambridge Health Alliance, and colleagues in a September 2020 perspective in *STAT*.

Similarly, Vyas, Jones, and colleagues have written about how slavery-era stereotypes regarding the shape of Black and white women's pelvises continue to appear in textbooks and to factor into clinical decisions such as whether to recommend attempting vaginal birth after a cesarean delivery (VBAC). Some textbooks and articles refer to "ethnic variation in pelvic architecture"; others note that white women's pelvises have a so-called gynecoid shape while Black women's pelvises have a nongynecoid shape associated with more complications during VBAC. Such language goes back decades to claims that gynecoid pelvises are better suited for childbirth than nongynecoid ones. Certain other factors statistically shown to correlate with successful vaginal birth, such as marital and insurance status, are excluded from consideration. Doubts strengthen in light of findings from Sweden and Canada that show that adding or docking points for race does not improve predictions.

"Are pelvises different in Canada?" asks Jones rhetorically.

Investigating and teaching the history of science is crucial, say concerned historians and medical students, Jones and Amen among them. Clinical decisions that include race must incorporate not only medical and scientific evidence but also social and historical context, urge researchers such as Arjun Manrai, an HMS assistant professor of biomedical informatics and of pediatrics at Boston Children's Hospital. Those looking to investigate differences among races or apply race-based practices must be careful not to directly perpetuate racism or assist purveyors of it, they warn.

"As we move forward in doing research, we have to be extremely vigilant that we don't hand ammunition to people who will distort factoids and exploit prejudice to do harm," says Isaac Kohane, the Marion V. Nelson Professor of Biomedical Informatics and head of the Department of Biomedical Informatics in the Blavatnik Institute at HMS.

Clinical decisions that include race must incorporate not only medical and scientific evidence but also social and historical context.

Until the knot of race, racism, and health gets unraveled, clinicians and professors must be frank with patients and medical students, says Reid.

"When we use race in medicine and medical education, there ought to be a reason, and we need to say what that reason is," she says. "If you're discussing race-based differences—whether for incidence, prevalence, risk, symptoms, diagnosis, treatment, or outcomes—talk about the causes of these racial differences. If we don't know, say that it needs additional research."

Race-based medicine's checkered history has made many professionals and patients of color cautious about new claims. In 2005, the FDA approved the first, and to date only, race-specific drug in the United States: BiDil, a combination of two established medicines to treat heart failure. After initially failing to convince regulators that the drug was effective, BiDil's designers conducted a clinical trial in Black participants only and successfully reapplied with the race-specific data. The hope that BiDil could help close racial gaps in heart health clashed with complaints about the study methods—namely, that the team hadn't provided an explanation for why a heart failure drug would work differently in Black people nor shown convincingly that BiDil was any more or less effective in other populations—and with Black communities' well-founded distrust of the medical establishment, as Jones explained in a volume he co-edited about BiDil in 2008. Sales lagged, and the company was sold not long after the drug's release.

Medicine by proxy

A common assertion holds that race and ethnicity serve as proxies for the true drivers of variations in health. Whether those drivers will prove to be inborn, a result of social determinants, or a mix of both remains hotly debated.

"Find me a person who thinks 'Hispanic' is a meaningful biological category," says Jones.

"It's easier to say 'race,'" says Reid, "but let's name it for what it is: racism and the impact on people who've been assigned an arbitrary designation."

In a 2018 *New York Times* op-ed, David Reich, a professor of genetics at HMS, wrote, "I am worried that well-meaning people who deny the possibility of substantial biological differences among human populations are digging themselves into an indefensible position, one that will not survive the onslaught of science."

Until scientists unearth the true drivers and reveal how closely or poorly they correspond with racial groupings, experts question the usefulness of using race as a placeholder.

"Race is a bad proxy," said Roberts in her TEDMED Talk. "It's just a distraction."

Yet excluding race from consideration altogether risks not only failing to notice injustices but also contributing to them.

"Ignoring race is not the forward-looking solution," says Manrai. "Seemingly race-blind approaches still harbor insidious bias."

Researchers, including Manrai and Kohane, are working to identify underlying causes of disease so clinicians can ditch racial proxies in favor of providing more precise care, moving from generalized to individualized medicine.

"In many cases, we don't have good substitutes for self-reported race and ethnicity," says Kohane. "I'm confident that in the future, with the help of bioinformatics and machine learning, we will understand enough about genetics and physiology to replace these imperfect and often misused labels with objective measurements. They're a way station as we travel toward something more scientifically robust."

Some argue that what we call race really refers to shared ancestry or geographic origins. Sickle cell trait, for example, which also protects against malaria, is most prevalent among populations from swaths of Africa and the Mediterranean where malaria is endemic. But if race stands in for ancestries or environmental adaptations that leave marks in DNA, then labels like "Black" aren't useful when Africa contains more genetic diversity than the rest of the world, researchers point out. They say medicine would be better served by asking patients which regions their ancestors hailed from or which ethnic groups they belong to. "It's certainly possible that a recent immigrant from Ghana, another from Ethiopia, and someone else whose ancestors from West Africa became enslaved, while all considered 'Black,' could have medically significant differences between them," says Jones, "and these would be missed by current practices."

Better yet, says Manrai, practitioners could skip the guesswork and do the gene sequencing to find out whether a person has a disease-associated variant or mutation. That would require making clinical sequencing technology more accessible and a standard of care. Researchers also must continue to ferret out relevant genes while ensuring that genetic data sets and analyses represent enough people from a variety of backgrounds to reach valid conclusions. Manrai, Kohane, and colleagues reported in a 2016 *NEJM* study that a disproportionate number of Black people were being misdiagnosed as having hypertrophic cardiomyopathy, a thickening of the heart muscle that can trigger fatal arrhythmias, because gene variants believed to contribute to the disease had not been studied in enough Black participants.

It's unclear how much value genetics adds when studies have revealed greater genetic diversity within racial categories than between races and when individual variants typically contribute small effects. When researchers uncover genes that do appear to differ in frequency or function from one racial group to another, they should make sure the differences are meaningful and get applied responsibly, experts emphasize.

In a 2006 article in the *Harvard Review of Psychiatry*, Jones and HMS professor of psychiatry Roy Perlis, MD '97, pointed to an allele that makes some people metabolize a certain drug faster than others do. The clinical conclusion was that since the allele appears in 2 percent of white people but 8 percent of Black people, "we should treat them differently," says Jones. "But the finding means 92 percent of Black Americans don't have that allele." It would be better to assume that most people aren't rapid metabolizers until proven differently, regardless of race, they wrote.

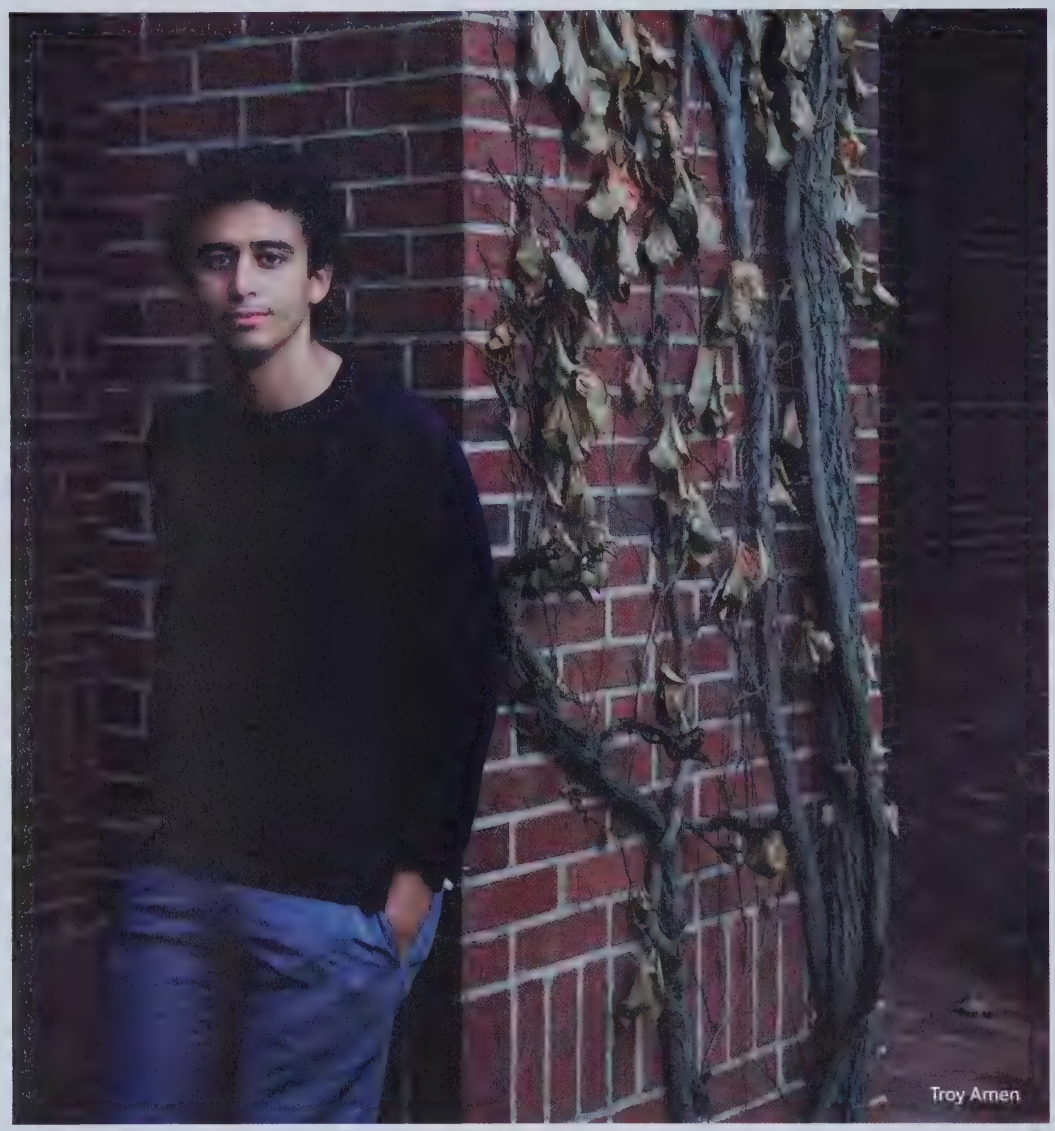
Medicine would be better served by asking patients which regions their ancestors hailed from or which ethnic groups they belong to.

Kohane and Manrai use biomedical informatics technologies to discover drivers, genetic or otherwise, that currently seem race-associated and to flag false signals.

"Large data sets allow you to tease apart what's real and what's rumor," says Kohane.

An area of particular interest to Manrai is a common test known as estimated glomerular filtration rate, or eGFR. The test measures circulating creatinine, a metabolic waste product, and uses it to calculate kidney function. More creatinine suggests the kidneys aren't filtering well—unless the patient is Black, female, or elderly. In those cases, slightly higher levels are considered normal. Why the race correction? It stems from a statistical analysis that found that Black individuals had greater measured kidney function at the same creatinine levels, age, and sex as non-Black people, explains Manrai. Some proposed that this was due to higher muscle mass—but that common hypothesis lacks evidence. Manrai and colleagues are using machine learning to investigate other ways to accurately estimate eGFR without using race. These approaches simultaneously consider environmental context, blood and urine biomarkers, and specific metabolites, he says.

In the meantime, facing the possibility that eGFR uses a racist algorithm, a handful of hospitals, including Mass General, Brigham and Women's Hospital, and Beth Israel Deaconess Medical Center, have dropped race as a correction factor. Not everyone is convinced that's the best solution. Manrai and colleagues, including third-year MD student James Diao, Herman Taylor, MD '80, and Neil Powe, MD '81, attempted to quantify the effects of race adjustment on Black patients in a December 2020 *JAMA* paper. They found that without race correction, more Black patients would be diagnosed with chronic kidney disease and at more advanced stages of disease, qualify for specialist care and insurance coverage of nutrition therapy and education, and become eligible for kidney


Troy Amen

transplants. Yet more also would be disqualified from donating kidneys, be prescribed lower doses of important medications, or be considered at higher risk for adverse events from those medicines. Interpreting whether dropping the correction factor serves Black patients better than current practice gets even trickier when, as Jones points out, it's not clear whether the status quo is correct.

Wrestling with race as a proxy also involves issues of implementation. Instead of asking the patient's race, clinicians sometimes make assumptions based on appearance. When they do get asked, patients don't always go into the intricacies of their identities and ancestries. A woman might simply say she considers herself Black when she has a rich history of Black, white, and Indigenous forebears from three continents. Some can't share the specifics of their ancestry because family histories were erased during the enslavement of Africans or the genocide of Indigenous people. Even if such nuances get articulated, studies haven't been done to fully assess the meaning of multiracial identities in health, nor of distinctions within defined groups, such as Navajo versus Aleut for someone labeled "American Indian/Alaska Native." Tools such as eGFR calculators and spirometers aren't designed to process anything beyond single, broad racial categories, either. In fact, many of the tests that employ race correction simply sort patients into "Black" and "not Black."

Getting past racial proxies is complicated, but biomedical researchers and practitioners can handle the complexity, and the effort is worth it.

Manrai confronted that fact firsthand when his mother, who'd developed diabetes, underwent an eGFR test to monitor her failing kidneys. An immigrant from India, she didn't consider herself Black, and she didn't understand why everyone not Black was assumed to be alike. Research participants of South Asian ancestry had not been well represented in the studies that established the race correction factors. Equally unsure how to get the most accurate results, her nephrologist decided to average the Black and non-Black calculations.

Getting past racial proxies is complicated, but biomedical researchers and practitioners can handle the complexity, and the effort is worth it.

"People say it's hard," says Jones. "But we put a man on the moon. Surely we can figure out descriptive epidemiology."

"Declining to study racism risks sounding like it's not a scholarly subject or something worth changing," says Jalen Benson, a second-year MD student at HMS. "I haven't experienced endometriosis, but that doesn't mean I can't learn about it and become an OB/GYN. You put in the work to become an expert."

Nip in the bud

As a child, Reid gathered from the way doctors treated her family members that it was considered acceptable for Black patients in the United States to have higher blood pressures and higher prevalence of kidney disease than white patients. She scratched her head when she read in her mother's copies of *Psychology Today* that there were racial differences in certain psychiatric disorders but no explanations why. She itched to know what drove the gap in life expectancy between Black and white men.

Reid figured answers would come when she enrolled in HMS as a medical student in the 1980s. But lectures and clinical training proved disappointing on that front.

Her pathophysiology professors commented, usually in passing, about how "Black patients have more this or that disease, but they rarely explained why this was true," she recalls. Few mentioned the social determinants of health. Only when she started residency did conversations, mainly instigated by students and trainees, dig for the roots of racial disparities in conditions such as high blood pressure and heart disease.

KELLY DAVIDSON

"It's really hard to speak up when you're at the bottom of the ladder. There's fear about academic and professional repercussions and whether people will be afraid to work with you."

Now, as co-chair of the Program in Medical Education's Task Force to Address Racism, Reid is coordinating efforts to reduce racism in medical education at HMS and its affiliated hospitals, including places where racism intersects with race-based medicine. The task force will tackle individual instances of racism—the easier part, Reid says—as well as the culture in which those occurrences are embedded.

"An instance is when one professor makes one comment about a race-based clinical indicator without explaining what race is a proxy for," she says. "A culture is where that is accepted as an appropriate way to teach."

Part of the solution involves recruiting and retaining more teaching faculty from groups underrepresented in medicine. Amen, who participates in an HMS initiative to diversify faculty and founded a group called Hope Medical Scholars to widen the student pipeline, thinks such efforts could help solve a problem that struck him when he began his coursework: that the persistent and unexamined linking of race with "undesirable states" such as poverty and intravenous drug use can create harmful pattern recognition in some students and reinforce existing stereotypes in others. In turn, he says, this can perpetuate health disparities and the "othering" of patients of color.

"It's really tough, especially when the people teaching you this material are older white men," says Amen. "I wonder if this would play out differently if more professors were people of color. Maybe they'd no longer say, 'Race is a risk factor,' but instead, 'This might be an association.' Just having someone who is Black or Hispanic teach you that could make the pattern recognition very different."

Task force members agree that the onus to challenge race-based medicine and to unearth the basis for racial disparities in health can't continue to fall on faculty, staff, students, and trainees of color, who already must shoulder the burdens of individual and systemic racism on themselves, their colleagues, and their patients. At the same time, Reid and colleagues strive to elevate the concerns of students of color to HMS leadership and to empower students to speak up when they encounter racism in their medical education.

The power structures inherent in the U.S. medical profession can make the latter decision exceptionally fraught.

"It's really hard to speak up when you're at the bottom of the ladder," says Amen. "There's a lot of fear about academic and professional repercussions and whether people will be afraid to work with you. Oftentimes it's easier to be silent and move on and hope things get better, either on their own or as you get more power."

It took three years before Amen felt comfortable enough to publish an essay on the website *Medium* about a racist incident he experienced during a clinical rotation.

Benson, too, has struggled many times with the conflicting desires to question race-based medical decisions but avoid jeopardizing his career. Once, his cohort was taught in the clinic that they should administer different blood pressure drugs to Black patients than to white patients. Benson says that when he asked why, his attending replied, circularly, that it was the standard of care.

"I'm a second-year medical student," Benson says. "I'm sure not going to tell my attending they're wrong or argue with them about the controversy in the field."

Arguing could result in being characterized as aggressive or combative in faculty evaluations, which would torpedo his chances of becoming a doctor as a Black man, Benson says. So until he climbs enough rungs to feel safe enacting change, he bites his tongue.

That includes memorizing race-based treatment recommendations that he believes can harm the patients he wants to serve in order to pass the U.S. Medical Licensing Examination. "I have to do it so I can become the doctor I want to be and dismantle racism embedded in this system," he says.

People doing the work hope to tap into the anti-racist energy that surged in the United States in summer 2020 following the killings of Breonna Taylor and George Floyd. Yet broader interest in racial justice may already be waning, as a recent Pew Research Center survey has suggested.

"At Harvard, we feel so ready for change," says Amen. "Unfortunately, the momentum has died down. I worry that in six months when we look back, we'll have missed a beautiful opportunity to impact Black student lives on campus."

Change must be embraced by those in power if it is to last rather than return to the norm, "which is to avoid talking about racism in medicine except in closed circles," says Reid.

When the student group White Coats for Black Lives convened HMS community members in June for 8 minutes and 46 seconds of silent kneeling to honor George Floyd, Reid was less impressed by the show of solidarity than concerned that action would stop there.

"The pictures of people kneeling were lovely," she says, "but what I really care about is what changes when you stand up." HM

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Particulates that Matter

BY STEPHANIE DUTCHEN

Small airborne particles cause big problems, and some populations breathe in an unequal share

TO BREATHE IS TO LIVE, but what if the air you breathe isn't clean?

Each year, outdoor and indoor air pollution together kill seven million people, according to a 2012 report from the World Health Organization. In the 1990s, the landmark Harvard Six Cities Study found that living in cities choked with air pollution reduces life expectancy by two to three years.

Most air pollution-induced sickness and mortality can be traced to particulates. No larger than 10 microns, or the size of a dust mote, these solid particles and liquid droplets slip through the body's initial filters and clog its airways. Exposure to them can cause asthma, chronic bronchitis, chronic obstructive pulmonary disease, and lung cancer. Particulates under 2.5 microns, or PM 2.5, such as flecks of soot, can permeate the bloodstream, leading to stroke, heart attack, and changes in blood pressure and cholesterol levels.

Doctors and researchers are still learning how far the effects extend. Exposure to fine particulates during pregnancy appears to raise the risk of premature birth, maternal and fetal death, and, in children, autism. Studies suggest that PM 2.5 can hinder children's neurological development, contribute to type 2 diabetes, and speed cognitive decline in the elderly. Genetic and immunological underpinnings are still being unraveled.

The burdens of unclean air are not distributed equally. Most at risk are the young, the old, and those with underlying health conditions. Vulnerability also is heightened among those who work outdoors, are poor, or belong to a historically marginalized group, particularly Black, Hispanic, and Indigenous people—likely because of circumstance, not biology.

Contributing factors can be hard to disentangle. People with low incomes are more likely than affluent people to have no choice but to live near pollution sources, whether those sources are industrial emissions in inner-city neighborhoods or mining dust on Native American reservations. Centuries of structural racism in the United States mean that those with low incomes are more likely to be people of color and that people of color are less able to access quality health care and more likely to have underlying or uncontrolled health conditions than white people.

"The health inequities mirror the environmental inequities," says Jonathan Gaffin, MMSc '11, an HMS assistant professor of pediatrics and co-director of the Severe Asthma Program at Boston Children's Hospital.

No escape

Gaffin and colleagues, including Wanda Phipatanakul, an HMS professor of pediatrics at Boston Children's, and Diane Gold, an HMS professor of medicine at Brigham and Women's Hospital, have spent years investigating the nature and effect of air pollutants on urban residents in the northeastern United States. They've collaborated on testing air-cleaning interventions and quantifying specific air pollutants, such as PM 2.5, in homes and schools and tying them to health outcomes in children.

In doing so, the team has helped show that people can't always escape outdoor pollution by going inside. Particulates and other pollutants seep through cracks and vents, and buildings can produce their own particulates, such as those from decaying infrastructure. Some pollutants can become even more concentrated indoors.

Air pollution and climate change represent two heads of the same beast. Both are produced during the burning of fossil fuels. Some particulates cloud the air with greater frequency and density as climate change whips up storms, droughts, and other extreme weather events.

"The good news is that since the evil twins of climate change and air pollution share a common source, any action to control one will control the other," says Philip Landrigan, MD '67, director of the Global Public Health Program and Global Pollution Observatory at Boston College and an HMS adjunct professor of environmental health.

Physician power

Clinicians have at least three routes open to effect change that could benefit patients.

First, they can educate themselves about the potential contributions of air pollutants to their patients' acute and chronic health problems. They can recommend evidence-based interventions such as refraining from outdoor exercise on days with bad air quality, using cleaner heating or cooking fuels, or, if feasible, installing home air filters or moving from pollution-heavy neighborhoods.

"Air pollution should enter the doctor-patient conversation alongside our traditional focus on personal behaviors," says Landrigan.

Gold emphasizes the importance of providing information to empower vulnerable patients as well as families, community members, and government officials. She co-authored an article on air pollution, climate change, and heart disease in 2013 that offers advice to patients and health care providers.

Second, clinicians can engage in studies. Gold and colleagues have linked PM 2.5 exposure to increases in blood pressure and higher risk of cardiac arrhythmias in people with heart disease. Gaffin is investigating whether indoor air pollution contributes to respiratory symptoms and diminished lung function in children with bronchopulmonary dysplasia who were born prematurely. Pulmonologist Mary Rice, MD '07, an HMS assistant professor of medicine at Beth Israel Deaconess Medical Center, has studied particulates and found that long-term exposure to traffic pollution may reduce lung function as much as smoking does. She's now exploring whether reductions in particulates improve COPD and whether high temperatures exacerbate the effects of particulates.

Third, clinicians can become advocates. Reducing air pollution and tackling climate change require large-scale efforts, and political activism offers opportunities to contribute. Rice has testified before Congress and the U.S. EPA and chairs the American Thoracic Society's Environmental Health Policy Committee. And Landrigan, who helped get lead removed from gasoline and paint in the United States in the 1970s, now focuses on pollution and climate change and is urging leaders of developing nations to forgo fossil fuel-based development and move directly to renewable energy sources. HM

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Through

The barrage of strife, unrest, and outrage over the deaths of Black people in this country falls hard on the young

BY ELIZABETH GEHRMAN

the Eyes of a Child

MAYBE IT HASN'T ACTUALLY BEEN THE WORST year ever, as internet memes are calling it, but for most of us, 2020 really has been "extra." Against the backdrop of a pandemic that has created economic havoc and kept people from loved ones and purpose-defining work, the country has endured its greatest social unrest in decades, largely driven by a relentless daily barrage of horrifying racial incidents delivered up close and in real time. And, in the ultimate betrayal, these incidents—from the killings of Black men at the hands of police to countless "Karen" encounters on public and private property—have often been encouraged by the very government meant to protect us.

If you, as an adult, have been feeling anxious and distressed, imagine what all this is doing to children.

"This year has been exceptionally challenging for Black youth," says James Huguley, interim director of the University of Pittsburgh's Center on Race and Social Problems. "Because of the racial disparities in our broken system, they're more likely to know someone affected by COVID-19. The social isolation makes everything worse, and most kids who receive mental health support get it at school, where most of them have not been since February. And at the same time all these racial atrocities in policing are happening."

Racial trauma operates on many levels, Huguley notes, from microaggressions to personal experiences with discrimination to longstanding, intentionally instituted structural disadvantages that over hundreds of years have led to ingrained economic hardship, housing insecurity, carceral system injustice, unsettling family dynamics, and other adverse consequences. "We do surveys with Black youth here in Pittsburgh, and kids ages 10 to 15 are reporting that people have been racist toward them," he says. "By tenth grade about fifty percent of them have encountered racial discrimination."

Black parents and educators point out that while white people are becoming more aware of discrimination, "where you stand depends on where you sit," according to Altha Stewart, past president of the American Psychiatric Association and a senior associate dean for community health engagement at the University of Tennessee Health Science Center. "If you sit in the midst of a storm of the kinds of events that don't usually make the news, that happen day in and day out in your community, it really is nothing new. The newness comes from the rapidity with which these images are coming at our kids."

TRACI DABERKO

And, Huguley points out, although children may not be experiencing firsthand the things they're seeing online or on television, "they're identifying with the person who is experiencing it, who looks like them, so the trauma is vicarious."

According to a 2018 paper in *Social Science & Medicine*, children are especially vulnerable to indirectly experienced racism because "children's lives are inevitably linked to the experiences of other individuals, and they are in critical phases of development." The researchers' review of the literature on vicarious racism and child health found thirty-eight statistically significant childhood outcomes—including "general illness," weight issues, depression, anxiety, socioemotional difficulties, delayed cognitive development, and externalized behavior problems—that can be associated with a child's indirect exposure to the prejudice and discrimination that friends, family, and strangers may experience and to experiences that "threaten a child's sense of the world as just, fair, and safe."

The effects of childhood trauma, whatever its cause, can be lifelong. A 2019 paper published in the U.S. Centers for Disease Control and Prevention's *Morbidity and Mortality Weekly Report* found that adverse childhood experiences, or ACEs, can "derail optimal health and development by altering gene expression, brain connectivity and function, immune system function, and organ function"; compromise "development of healthy coping strategies, which can affect health behaviors, physical and mental health, life opportunities, and premature death"; and have been linked with "increased risk for alcohol and substance use disorders, suicide, mental health conditions, heart disease, [and] other chronic illnesses," including stroke, asthma, lung disease, cancer, kidney disease, diabetes, and depression. Other studies have associated adverse childhood experiences with obesity, physical inactivity, and high-risk sex behaviors, and, the *MMWR* authors write, these experiences have "been linked to reduced educational attainment, employment, and income."

Adverse childhood experiences can derail optimal health and development.

Bone deep

The roots of these effects can be seen far earlier than once thought possible. "We used to think that preschool kids experiencing a lot of adversity where they live or in their family didn't understand what was going on or were too young to remember," says Jack Shonkoff, an HMS professor of pediatrics at Boston Children's Hospital and director of Harvard's Center on the Developing Child, where he chairs the JPB Research Network on Toxic Stress, a research collaboration that is developing biological and behavioral measures of stress activation and resilience in children 4 months to 5 years old. These metrics include pro-inflammatory cytokine levels, epigenetic effects, cortisol levels over time, and measures of executive functioning skills and attention span.

"The general public belief is that early experiences don't have lasting impacts until kids get older," says Shonkoff, who is also the Julius B. Richmond FAMRI Professor

Alisha Moreland

of Child Health and Development at the Harvard T.H. Chan School of Public Health and Harvard Graduate School of Education and a research associate at Massachusetts General Hospital. "But now we know that even very young kids are affected. The biology makes it clear: The body doesn't forget. Early experiences both positive and negative literally shape the architecture of the developing brain and other biological systems from the beginning."

Alisha Moreland, a member of the HMS faculty of psychiatry and director of trauma-informed treatment, consultation, and outreach at McLean Hospital's Center of Excellence in Depression and Anxiety Disorders, explains that the brain develops "from the bottom up and the inside out," with deep brain structures like the amygdala, hippocampus, and hypothalamus that play a role in fear conditioning and the stress response; the brain stem and midbrain structures handling basic functions like regulating heart rate, breathing, sleeping, and eating; and the topmost parietal and frontal lobes managing sensation, perception, and executive function.

"Adolescents are impulsive and need external cues because their brains are still developing," she says. "Part of the work of becoming an adult is learning how to modulate the fear response and move toward safety. But when the sense of threat never goes away, and you're in a chronic state of seeking safety, that short circuits higher-order functions."

Moreland mentions the seminal ACEs study undertaken by the CDC and Kaiser Permanente and published in the *American Journal of Preventive Medicine* in 1998. For that study, researchers assessed responses from nearly ten thousand individuals who Moreland notes "were overwhelmingly white, middle class, insured, and educated." They found that more than one half of the respondents had had at least one adverse experience—a litany of harms that included psychological, physical, or sexual abuse, or living with a mentally ill or suicidal individual—that increased the risk for chronic health and behavioral problems. One quarter of the respondents had had two or more such experiences.

"That's significant because the cohort had so many protective factors," she says. "But even with working protective factors, individuals reported that something from their childhood had a significant impact."

Both Moreland and Shonkoff mention three kinds of stress children can experience. Positive stress, they explain—the body's response to normative experiences such as being made to share toys or going to day care for the first time—is healthy, teaching children coping mechanisms they can use throughout life. Tolerable stress is more serious, such as that following the death of a loved one, a natural disaster, or ongoing family discord. The most harmful level of stress, toxic stress, occurs when the stressor is severe and fairly continuous and there is no counterbalance, as experienced in some orphanages or other living situations marked by significant neglect or

The most harmful level of stress, toxic stress, occurs when the stressor is severe and fairly continuous and there is no counterbalance.

from the relentless additive effect of stressors such as deep poverty, systemic racism, and community violence. With toxic stress, Moreland points out that the need for safety—a basic need that forms the foundation of psychologist Abraham Maslow's hierarchy of needs pyramid—isn't fulfilled, making it more challenging for individuals to gain the sense of belonging, love, and self-esteem required to achieve the full potential and creativity at the pyramid's top. Shonkoff adds that the persistent wear-and-tear effects of toxic stress on multiple organ systems can lead to higher rates of chronic physical impairments across a lifespan.

"Any environment that is devaluing or invalidating can contribute to stress," Moreland says. "And racism is one form of that." In children, toxic stress can look like clinginess, nervous habits, withdrawal, lack of focus, mood swings, reluctance to go to school, irritability, anger, acting out, and other troubling behaviors. "Black children and teens are more often misdiagnosed with disorders like ADHD because they are hypervigilant or aggressive," Stewart says. "This could be the result of racial trauma."

It also could be a perfect example of a vicious cycle created by bias in the labeling system. Oppositional defiant disorder is diagnosed more often in children of color, and at least one study found that among adolescents who become involved with the justice system, Black males are 40 percent more likely, and Black females 54 percent more likely, to be diagnosed with conduct disorder than white

"When the sense of threat never goes away, and you're in a chronic state of seeking safety, that short circuits higher-order functions."

males and females, "even upon considerations of trauma, behavioral indicators, and criminal offending." And even though high school suspension rates have dropped in the past decade, a 2016 study by the federal government's Civil Rights Data Collection program found that Black students in high school are still twice as likely to be suspended as their white and Hispanic peers.

Clearly, something needs to change.

A guiding hand

The phrase "trauma-informed care" existed as far back as the mid-1980s, but the practice has come into widespread use only in the past decade. It's an ACEs-based care approach that assumes everyone has had some trauma in their lives, and it starts not by asking "What is wrong with this person?" but instead "What has happened to this person?" It informs all aspects of school and social service programs or medical practices beginning on the first day or in the waiting room by "creating a physically and emotionally safe environment, establishing trust and boundaries, supporting autonomy and choice, creating collaborative relationships and participation opportunities, and employing a perspective that focuses on strengths and empowerment to promote resilience," according to the Institute on Trauma and Trauma-Informed Care at the University at Buffalo Center for Social Research.

Trauma-informed care aims to help people get "through," not "over," hurtful events in their past, but some have suggested it doesn't go far enough for children and adults of color. Researchers from the National Crime Victims Research and Treatment Center at the Medical University of South Carolina, writing in the *Journal of Child and Adolescent Trauma* in 2020, suggested an update to the care protocol. The article, which proposes a culturally informed model for reducing the mental health effects of racism-related experiences, points out that "theoretical models of early childhood adversity have largely neglected the multifaceted influence of racism on mental health outcomes" and proposes extending the ACEs framework by making racism a distinct ACEs category.

"Gaining a more accurate and nuanced understanding of the prevalence, impact, and typologies of ACEs that disparately influence Black youth," the paper states, "can shed light on targetable areas of intervention at the individual (e.g., adaptive coping strategies), contextual (e.g., community initiatives), and institutional (e.g., equitable health care) levels that can disrupt the noxious and lasting effects of adversity."

Some schools and extracurricular programs have been leading this charge for decades. A scholar of the social foundations of education, Kristal Moore Clemons heads the Children's Defense Fund's Freedom Schools, a six-week summer literacy and cultural enrichment program that grew out of the Mississippi Freedom Summer Project of 1964 and, Clemons says, "empowers children to see beyond their current circumstances." It encourages children to read books that reflect the Black experience and starts each day with songs, cheers, chants, and stomps focused on the concept of harambee, which is Swahili for "let's pull together."

Inside, out

For clinical physicians, trauma-informed and culturally-informed ACEs care means conveying understanding and trust, being aware of structural identity-based issues, and collaborating with patients in the healing process. It also means being careful not to retraumatize patients by requiring them to tell their stories repeatedly, regarding them as a number, labeling them, or being punitive or oppressive in language or treatment approaches.

"Frankly, some of the most troubling disparities are in the health sciences," says Huguley. "On top of hundreds of years of medical exploitation, skewed research, gaps in infant mortality rates and maternal health, and clinical bias, there are countless sad stories about personal encounters in medical offices. Medicine really needs to look internally at this, because behind every hypertension statistic, there's a life."

Stewart agrees. "Anyone who is practicing today and not incorporating into their encounters with patients something that speaks to what's going on in their world that can contribute to their symptoms may not be taking into full account the extent of our oath to provide the best possible care to the people who come to us."

The first thing pediatricians and primary care providers must do is check their own biases and work to understand the origins of racial inequality, says Huguley. Mentoring students who are underrepresented in medicine also goes a long way toward increasing the pipeline of professionals all patients can relate to—and working to become part of the scaffolding of resilience for children can make a difference in individual lives.

We know we can keep tolerable stress from becoming toxic and behavior from going off the rails, Shonkoff notes, by providing protective adult relationships that make kids feel secure. "No child can survive significant adversity by pulling themselves up by the bootstraps," he says. "But whether it's a parent, a childcare or health care provider, a neighbor, or a teacher, just one person can confer the protective effect, bringing the stress system back to baseline by providing caring support."

Adults may be able to parse racial discrimination for both themselves and the children in their lives by finding and using daily techniques that aim to help navigate this world of traumas. One such technique, LET UP, was developed by Dana Elaine Crawford, a clinical psychologist practicing in New York City and now scholar-in-residence at Columbia University's Zuckerman Institute. It was first published in 2019 in the journal *Zero to Three*, a publication developed by the National Center for Clinical Infant Programs in collaboration with the American Academy of Pediatrics; the journal focuses on early brain and child development. The acronym, Crawford says, stands for "listen, empathize, tell your story, understand, psychoeducate."

The first three steps are designed to help the person who is being confronted by a racist statement or action to calm and center themselves and deflect deep harm by providing themselves with personal perspective.

Clinicians and nonminorities are the people for whom understanding is important, says Crawford. They must examine their role in the larger system of bias, prejudice, and racism and consider the experiences the person they're addressing has probably had. But the "psychoeducate" element of Crawford's method is for everyone and simply means talking to the perpetrator about what happened. Even younger children can benefit from such approaches, says Crawford, if they're presented in a developmentally appropriate way. "When I talk to kids about racism and bias," she says, "I tell them it's a type of bullying based on someone's skin color. 'People bully because they're scared or feel bad about themselves or because they're not sure they'll have enough of something so they want to keep it from you.' Once they get a little older you can start talking about structural racism."

We know we can keep stress from becoming toxic and behavior from going off the rails by providing adult relationships that make kids feel secure.

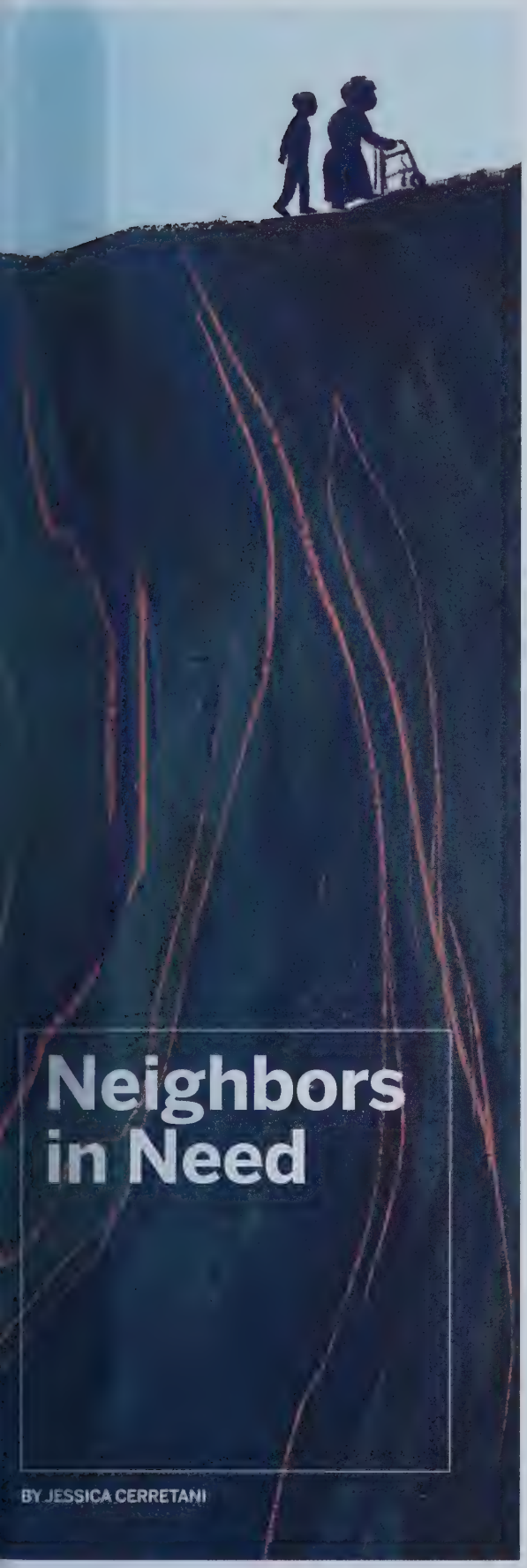
In schools and neighborhoods, joining or creating anti-racist groups can not only help change subtle and overt bigotry but can also be empowering to those involved. "Parents should go to school board meetings, join parent-teacher associations, and talk to their children's teachers," says Clemons. "More than 90 percent of the parents we work with become interested in engaging in social action with the child, taking them to marches and so forth." Becoming an activist, in however small a way, Clemons adds, "will teach children a sense of community, encourage resilience, and show them how communicating can build better relationships."

Shonkoff says such interventions are helpful and that in the future, individualizing them will make them even more effective. "As with acute lymphoblastic leukemia in childhood," he says, "if conventional treatment isn't working, we don't just shrug and give up. We go to plan B. We start with what we know in general works, then focus on the fact that we'll see variability of response."

"Still," he says, "there is an even better way to solve the problem. In the same way that using a vaccine to prevent infection is better than trying to treat the illness, we really need to go upstream and address common sources of stress—poverty, racism, housing insecurity, and food insecurity—that pile up on families with young children." HM

Elizabeth Gehrman is a Boston-based writer.


CLINIC



Neighbors in Need

BY JESSICA CERRETANI

ANGELA HSIEH

For decades, community health efforts have brought care to people in areas underserved, and often overlooked, by mainstream medicine

DRIVING HOME FROM WORK ONE DAY, Charles Moore, MD '91, took a detour. Propelled by nothing more than a list of three zip codes in the Atlanta area and a growing curiosity about his patient population, he exited Interstate 20 toward Bankhead. Moore wasn't quite sure what he expected to find, but he pulled over, started walking, and struck up conversations with the people he met, simply chatting about the neighborhood.

"I didn't tell them what I was there for, because I honestly didn't know," he recalls. "I just wanted to meet people and try to make a difference."

A head and neck surgeon and chief of service in Grady Health System's Department of Otolaryngology, Moore had chosen those zip codes based on what he had discovered in his patients' charts. At Grady, he saw a slew of late-stage head and neck cancers in patients for whom palliative care was by then the only option. Many of these advanced cancers would have been treatable had Moore's patients sought care sooner. When he took a deeper dive into their records, a pattern emerged: The majority of them resided within three zip codes, areas that represented impoverished neighborhoods plagued by unemployment, crime, and lack of resources.

For these patients, health care wasn't a priority. Often without insurance and reliable transportation and faced with immediate concerns such as paying for food, rent, and utilities, they simply couldn't make it one. It was a bleak conclusion that Moore drew based on his conversations during that and other after-work detours—and one that he realized could no longer go ignored.

"Every time I saw a patient with advanced cancer, I'd think to myself, Somebody needs to do something about this," he says. "Then one day, I thought, Well, maybe that somebody should be me."

A history of change

Moore didn't realize it then—in fact, he says, community health was little more than a blip on his radar during medical school and residency—but he was following in the footsteps of activists who transformed health care delivery in both rural and urban neighborhoods across the United States.

Today, community health centers serve some 28 million patients, providing comprehensive, high-quality care in underserved communities, typically those characterized by poverty, elevated health risks, and a shortage of medical resources. Offering a range of services such as preventive and primary care, social services, and treatment for substance use disorders, they form the backbone of modern U.S. health care—and save the health care system more than $24 billion annually, according to the National Association of Community Health Centers.

This model of health care isn't new. Elements of it have long been present around the globe, from Africa to Europe. Yet commu-

nity health centers are a relatively recent phenomenon in the United States. Stemming from the civil rights movement of the 1960s, their roots grow deep in a state regarded as the epicenter of that movement: Mississippi.

It was 1964, the year of the Mississippi Freedom Summer Project, when hundreds of young people descended on the state with the goal of registering as many Black voters as possible. It was a violent summer, marked by bombings, arson, beatings, and the killings of civil rights workers and their supporters. Among the volunteers were doctors and nurses, there to provide medical protection for those registering voters and fighting for civil rights. These medical volunteers were led by Jack Geiger, a physician who, at that time, was the Mississippi field coordinator for the Medical Committee for Human Rights, a group that was essentially the medical arm of the civil rights movement. Geiger was a founding member of the medical committee.

Even as the summer wound down, Geiger kept returning to the state, often accompanied by Count Gibson, chair of the Department of Preventive Medicine at Tufts University School of Medicine. The department also focused on community medicine.

Like Moore would decades later in Georgia, Geiger and Gibson had become acutely aware of the dearth of medical care for native Mississippians. "That fall we kept going back to Mississippi," Geiger would later say in an oral history for the Library of Congress. "We had started a small clinic staffed by volunteers and some other efforts to provide local health services. Nothing comprehensive, but the need was staggering."

Community health centers have grown, fueled by support from such disparate sources as the late Senator Ted Kennedy and the Black Panther Party.

Inspired by his earlier medical rotations at community primary care centers in South Africa, Geiger pitched Gibson on a similar concept: a health center in Mississippi that would also serve as a catalyst for greater social change. By 1965, Geiger and Gibson had secured funding from the newly formed U.S. Office of Economic Opportunity—not just for a community health center in rural Mound Bayou, Mississippi, but also for one at Columbia Point, an urban housing project in Dorchester, Massachusetts.

Over the years, community health centers have grown, fueled by support from such disparate sources as the late Senator Ted Kennedy and the Black Panther Party, which established a series of community-based free clinics as part of the Panther's mission to end systemic discrimination against Black people and the poor.

For the most part, community health efforts have enjoyed bipartisan support from politicians seeking cost-effective approaches to address poverty and related concerns. Yet programs supporting such efforts can remain strong only if government funding and backing remains intact. Community health efforts rely on the Affordable Care Act and the Community Health Center Fund. The latter, which was originally set to expire in May 2020, was extended through November as part of the Coronavirus Aid, Relief, and Economic Security Act. Because the future of such federal programs remains te ous—and has been jeopardized unde Trump administration—some commu health centers rely instead on state and grants, private philanthropy, or a comb tion of these.

Regardless of how they receive fund all community health centers follow a s lar model: they are embedded in area need, have strong ties to the commun they serve, and are guided by the mem of those communities.

In the right hands, this model ca quite successful.

Door-to-door care

For nearly three decades, residents of Bo communities with the highest burde health disparities have had access to pre tive screenings, health coaching, and refe to health and social services—all with having to set foot in a brick-and-mo clinic. This is the result of the Family Va mobile wellness unit that meets people w they live, work, play, and pray. The goals to remove barriers to care, improve hea and address health care disparities in vul able neighborhoods.

The van is the brainchild of Nancy O MD '79, faculty associate dean for comm nity engagement in medical educatio HMS and an obstetric anesthesiologist 1990, a *Boston Globe* series "Birth in 'Death Zones'" shone a light on what O had long observed in her patients: In mortality rates in Boston were linke

"Imagine the difficulty when you have children, have multiple jobs, and are four bus lines away from your obstetrician. The health care system is absolutely not set up for the working poor."

y Baughman, HMS
ructor in medicine at
sachusetts General
pital, working at Boston
e field hospital in May.

Answering the Call

From the Dean

In the face of the most daunting health crisis of our time, Harvard Medical School has demonstrated its unwavering commitment to serving humanity by working to alleviate suffering and improve health and well-being for all through teaching and learning, discovery and scholarship, and service and leadership.

From the outset of the new coronavirus pandemic, HMS has mobilized to save lives and prevent future pandemics. Our community has worked to provide the best care to those affected by COVID-19 while simultaneously launching an intense drive to decipher the biology of SARS-CoV-2, develop therapies and deliver cures.

Our faculty has propelled HMS pedagogy into new realms while our students have volunteered in hospitals and clinics and created a COVID-19 curriculum shared and used around the world.

The pandemic has challenged every one of us, but HMS has been steadfast in its dedication to science, medicine and education. I am privileged to lead and serve this exceptional institution and to highlight some of its extraordinary work in this report.

Jonathan Abraham, assistant professor of microbiology in the Blavatnik Institute at HMS, co-leads MassCPR's therapeutics working group.

Service and Leadership

Within months after SARS-CoV-2 emerged at the close of 2019, HMS launched a collaborative research initiative, the Massachusetts Consortium on Pathogen Readiness (MassCPR), to respond to the virus and prepare for future pathogen outbreaks. The initiative, seeded by a generous foundational gift from the China Evergrande Group and additional gifts to the HMS COVID-19 Response and Research Fund, aims to elucidate the basic biology of the virus; to understand its behavior on the molecular, cellular and organ levels; to inform disease detection; and to propel the design of treatments and vaccines. Its work encompasses clinical management and outcomes research, diagnostics, epidemiology, pathogenesis, therapeutics and vaccine development.

A multi-institutional collaboration involving the Guangzhou Institute of Respiratory Health and hundreds of scientists, clinicians and public health experts based in Massachusetts, MassCPR is working with international colleagues to confront the pandemic. In May, the consortium announced more than $16.5 million in initial funding for 62 high-impact SARS-CoV-2 and COVID-19 research projects selected for their potential to swiftly influence clinical outcomes in patients and populations. Progress has been brisk. The first phase of one clinical vaccine trial began just six months after the virus's genome had been sequenced. By midsummer, mRNA-based and adenovirus-based vaccine trials were underway in Boston.

A broad range of research is ongoing. In one instance, teams collected clinical samples from more than 400 patients with COVID-19 to create a biorepository shared with Boston-area research scientists, facilitating the collection and sharing of information, samples, observations and results.

As the crisis dawned, HMS convened the state's top health care leaders, who identified the need for broader testing capabilities, more personal protective equipment for health care providers and greater hospital capacity. Harvard Catalyst | The Harvard Clinical and Translational Science Center, along with HMS clinical research centers, provided support to our affiliated hospitals, with translational teams assisting on study development and medical testing oversight. Hospital investigators began exploring new avenues to therapies, including antivirals, anticoagulants, immunotherapies, cytokine control agents, kinase inhibitors and plasma-based therapies. A streamlined IRB process facilitated 131 COVID-19 multisite clinical trial studies across the U.S.

HMS faculty with extensive experience combating infectious disease outbreaks organized to work with the Commonwealth of Massachusetts on the COVID-19 Community Tracing Collaborative, and they partnered with other communities and nations to help guide containment efforts through screening, rapid testing and prevention. Faculty in the Department of Health Care Policy assessed the efficacy of COVID-19 treatments and examined the structural and financial issues leading to coronavirus deaths in U.S. nursing homes, and they explored how low U.S. vaccination rates may affect the pace of COVID-19 infections and the development of herd immunity once a vaccine becomes available.

In a little more than a week, HMS faculty successfully helped design, staff and lead operations at Massachusetts' 1,000-bed Boston Hope post-acute field hospital, with scores of HMS clinicians caring for more than 700 patients in the months that followed. Joining our physicians, a group of graduating HMS students took to the wards for an unprecedented learning opportunity that will prepare them for leadership roles in health care.

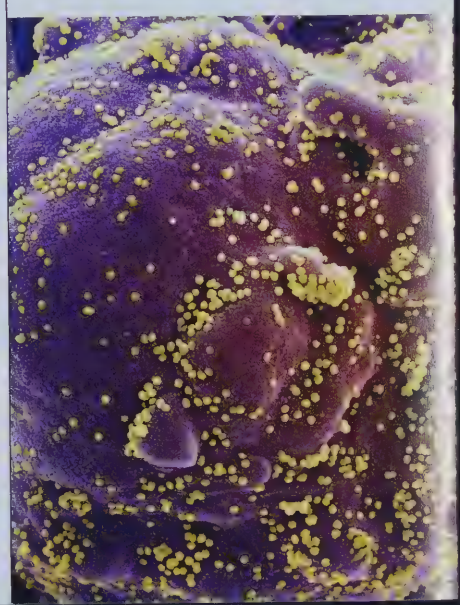
In the midst of the crisis, other outstanding work at HMS continued unabated. We began the academic year celebrating the 50th anniversary of the School's historic diversity and inclusion initiative, recognizing 1,350 people of color who have graduated from HMS and the Harvard School of Dental Medicine since 1969. We held our first-ever Juneteenth gathering to celebrate and advance the cause of social justice as we renewed our pledge to build a diverse community of excellence at HMS—one able to provide the best care to every human being.

HSDM announced its new dean, William V. Giannobile, who began his term on Sept. 1. Renovations on the Francis A. Countway Library of Medicine resumed after a brief pause due to COVID-19 restrictions, with library services remaining available remotely.

Teaching and Learning

HMS education programs rapidly recalibrated to continue providing the highest quality learning experiences while protecting the health of the entire community. Faculty, students and staff moved swiftly to remote learning and off-site work; clinical rotations were halted; and labs not directly working on coronavirus research ramped down operations. Clinical faculty engaged in intense planning, often spending days on the frontlines caring for COVID-19 patients and nights creating new online learning materials for students.

Faculty formulated entirely new curricular approaches that allowed students to continue their studies uninterrupted. Within weeks, objective structured clinical examinations were converted to virtual formats. A five-module

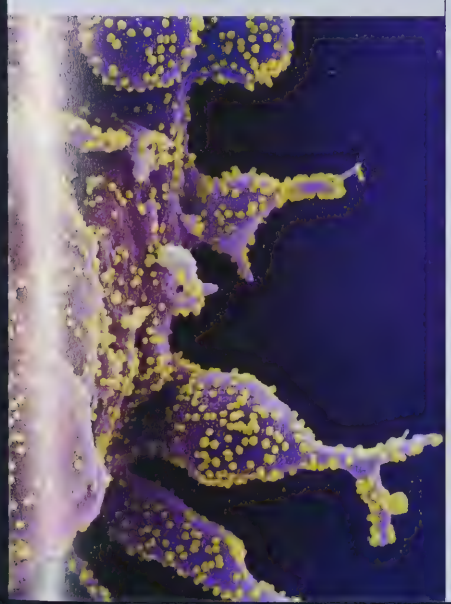


Colorized image of SARS-CoV-2 infecting a cell.

IMAGES: AMY BAUGHMAN; DANIEL SZAL, NATIONAL INSTITUTE OF ALLERGY AND INFECTIOUS DISEASES

nedicine course was designed, and online
ives were created for clinical students
hose who had already completed their
pal Clinical Experience.
udents created a comprehensive
D-19 curriculum, which was translated
2 languages and used in more than 100
ries. They produced COVID-19 informa-
resources for the public in more than
guages. Connecting with more than
ealth care resources in the Boston area,
nts helped provide care to vulnerable
ations, including homeless and elderly
luals.
ulty produced videos demonstrating
o perform physical exams remotely, and
worked with tech teams to enable stu-
to participate in remote patient visits.
al radiology course for 111 students
reated in less than a week's time that
ed daily interactive lectures, imaging
sessions, curated case reviews and
. A virtual clinical pathology course al-
students to make weekly presentations
ulty, fellows and residents. An entire
om-based course, Homeostasis I,
nline in a day. Through valiant efforts,
hool's first-ever virtual Match Day and
Day ceremonies took place on schedule.
Program in Graduate Education
all master's and PhD courses online
plemented plans for predominantly
rotations in laboratories. Dissertation
es moved to teleconferencing, with 53
defenses held by the fall in Division of Medical Sciences programs. Career and professional development programming moved online, with 20 workshops hosted. A new online programming course was created to support students' remote data analysis, and resources were made available to aid faculty in moving courses online for the fall.

The Office for External Education—already a leader in providing innovative virtual learning experiences—was uniquely positioned to keep physicians, nurses, other health care professionals, executives and the public abreast of the latest coronavirus developments. External Education offered COVID-19-focused webinars and accredited programs on topics ranging from health care inequities to management of clinical complications to promotion of mental wellness. Relevant portions of the HMX online immunology course were opened to all, and new HMX Pro courses provided science and business leaders with education on frontline topics. Harvard Health Publishing's Coronavirus Resource Center helped millions stay informed by providing reliable answers to questions about COVID-19.



Discovery and Scholarship

HMS labs responded to the pandemic with agility and speed. Researchers who shifted to remote work increased their grant applications by more than 20 percent over the same quarter the previous year, while those remaining on campus refocused on COVID-19. VirScan, an antibody-detection tool developed at HMS and Brigham and Women's Hospital, is now being used to understand how the coronavirus affects the immune system and to gain insight into the epidemiology of the disease. Research into the development of therapies to neutralize and disable SARS-CoV-2 began, while other studies were launched to investigate existing vaccine-enhancing adjuvants. Meanwhile, the role of genetics in disease severity is being examined: HMS scientists are probing how certain gene variants might increase or decrease susceptibility to the virus, and a study of gene dynamics in cell cultures may uncover clues about how the body responds to the virus at the molecular level.

Throughout the year, basic science discoveries continued. One study showed how nervous system activity affects human longevity, another measured how measles infection can cause immune amnesia, and yet another examined the sometimes-fatal effects of sleep deprivation. One study captured the first 3D images of a cancer-related protein complex to better understand mutations that lead to cancer; another identified the single largest genetic contributor to height known to date. Nine of our faculty were elected to the National Academy of Medicine, six to the American Academy of Arts and Sciences and five to the National Academy of Sciences.

The Dean's Innovation Awards program granted more than $18.5 million to 76 projects involving 146 investigators across the community, catalyzing collaborations in fundamental, curiosity-driven research. More than a quarter of the projects involve co-investigators at HMS-affiliated hospitals and research institutions. An additional $3 million was awarded to 33 projects driving innovation in education, administrative efficiencies and diversity in fiscal year 2020.

Our Therapeutics Initiative, a key contributor to our COVID-19 response, is building infrastructure, supporting translational research projects and training the next generation of therapeutics investigators in the Blavatnik Institute at HMS and at our 15 affiliated hospitals and research institutions, with the goal of accelerating the translation of basic scientific discoveries into transformative new treatments. We launched The Foundry to support research infrastructure, awarding more than $11 million to enhance our core facilities and bring additional innovative technology to the Quad. One Foundry project aims to solve central problems in quantitative image analysis through machine learning and computer vision; another seeks »

MORE RESEARCH NEWS
hms.harvard.edu/news/discovery

HMS by the Numbers

701

Total students: MD | PhD **894** (893 HMS, 1 HSDM) | MD-PhD **194**; basic sciences **168**, social sciences **26** (total included in MD and PhD counts) | DMD **144** | master's **360** (309 HMS, 51 HSDM) | DMSc **38** | trainees (residents and postdoctoral fellows) **9,036**

Total faculty **11,998**

Tenured and tenure-track faculty on campus in **11** preclinical departments **186** | Voting faculty on campus and at affiliates **6,307** | Full-time faculty on campus and at affiliates **9,954**

Medical school **living alumni:**

10,627

(MD and master's)

10 **Nobel Prizes**

(cumulative) Physiology or Medicine, Peace **16** recipients | National Academy of Sciences members (current) **83** | National Academy of Medicine members (current) **160** | Howard Hughes Medical Institute (current) **37** (4 Faculty Scholars, 32 Investigators, 1 Professor)

6,708

MD applicants | Admitted **234** (3.5%) | MD entering 2020 **168** (includes 15 MD-PhD) | Men **67** (40%) | Women **101** (60%) | Underrepresented in medicine (African American, Hispanic, Mexican American, Native American) **36** (21%) | Asian **64** (38%)

Entering 2020: PhD **161** (161 HMS) | DMD **35** | master's **212** (196 HMS, 16 HSDM) | DMSc **9** | Additional combined degree programs: MD-MAD; MD-MMSc; MD-MBA; MD-MPH; MD-MPP

AS OF SEPTEMBER 2020

Affiliates

Beth Israel Deaconess Medical Center
Boston Children's Hospital
Brigham and Women's Hospital
Cambridge Health Alliance
Dana-Farber Cancer Institute
Harvard Pilgrim Health Care Institute
Hebrew SeniorLife
Joslin Diabetes Center
Judge Baker Children's Center
Massachusetts Eye and Ear | Schepens Eye Research Institute
Massachusetts General Hospital
McLean Hospital
Mount Auburn Hospital
Spaulding Rehabilitation Network
VA Boston Healthcare System

to develop high-complexity synthetic antibody libraries that may one day evolve into one of the largest libraries of fully sequenced synthetic antibodies in existence. Following the hiring of a new leader, our Center for Computational Biomedicine is harnessing and amplifying computational and data sciences to better connect data science efforts at HMS, across Harvard, at Harvard-affiliated hospitals and in industry.

This year has required great sacrifices, but it also has summoned our best instincts and rallied our most noble efforts at a historic moment in medicine. This is our calling. Our work is far from done, but my faith is constantly renewed. At HMS, we can and will continue to achieve great things in our unrelenting quest to help and to heal humanity. ■

Fundraising

"The good we do today becomes the happiness of tomorrow." Harvard Medical School alumnus William James, the 19th-century philosopher considered to be the father of American psychology, echoed this maxim in his writings. This sentiment still resonates at HMS, where our circle of 3,662 supporters gave nearly $207 million in fiscal year 2020 to advance our mission of alleviating suffering and improving health and well-being for all.

The contributions from generous alumni, friends, volunteers, faculty, staff, foundations and corporations have been wide-ranging and hugely impactful, enabling us to establish a multi-institutional research consortium to combat the COVID-19 pandemic and create a rapid-response system to address future health crises.

We established the Hock E. Tan and K. Lisa Yang Center for Autism Research to identify the biologic roots and molecular changes that give rise to autism and related disorders, helping us work toward the goal of developing better diagnostic tools and new therapies for these disorders.

We increased the number of scholarships, financial aid packages and fellowship funds for MD, MD-PhD, PhD and master's students and boosted funding for postdoctoral researchers. We bolstered emergency aid for students, catalyzed collaborations in cancer research and care, helped address the most pressing challenges in global mental health and established professorships to recognize in perpetuity our extraordinary clinicians, researchers and educators.

With the continued aid of our loyal benefactors, we know HMS will continue to play a critical role in the protection and improvement of human health. ■

Financial Report

Fiscal year 2020, which ended on June 30, was a year of crisis and courage and many financial ups and downs. As seen in the accompanying charts, operating revenues totaled nearly $810 million, an increase of $5 million compared with the prior year. Notably, the School's endowment income grew by $6 million to $196 million, offsetting slight reductions in other program revenues. Total operating expenses increased by $13 million, from $753 million to $766 million.

Putting these financial figures into perspective, this apparent surplus of revenues over expenses, as reported according to generally accepted accounting principles (GAAP), includes targeted philanthropic contributions received in FY20 that will be invested over the coming years. Most notable among these was an installment of the Blavatnik Family Foundation gift. Drawing closer attention to our balance of unrestricted cash flows, however, provides a more nuanced view of the financial challenges we have faced and will continue to confront due to COVID-19.

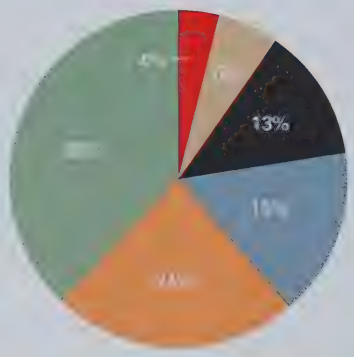
Before the pandemic, HMS was poised to reach a cash flow break-even point in FY20 and the first truly balanced budget in a decade. Unfortunately, the coronavirus crisis exacted a heavy toll on school finances in many of the same ways it has devastated the global economy. Revenues at our affiliated hospitals plummeted to an even greater extent, as most clinical operations were halted to meet the onslaught of patients with COVID-19. As a gesture of shared sacrifice, HMS waived the annual financial contributions the affiliates provide to HMS to support operations.

In the dark days of March, April and May, HMS was facing a projected $59 million deficit. However, the HMS community responded with deferred discretionary spending, delayed renovations and capital projects, and reduced hiring. As a consequence of judicious cost reductions and public-spirited self-sacrifice, coupled with increases in grant submissions, growth in master's and external education programs, and generous support from donors, our losses were not as deep as originally expected.

HMS closed FY20 with a $34 million cash flow deficit in its unrestricted accounts, a remarkable achievement when considering that $30 million of that shortfall resulted from our waiving the hospital affiliates' annual contributions. We will remain vigilant and continue to navigate the uncertain future and the economic consequences that come with it.

I am immensely grateful to every staff member, administrator, student, trainee and faculty member who responded to this pandemic with resolve and compassion for fellow members of our community, thereby enabling HMS to remain strong and continue to deliver on our mission of research, education and clinical care.

—Dean George Q. Daley



FY 2020 OPERATING REVENUE

Research grants and contracts	$308,660,119	38%
Endowment distribution for operations	$196,464,337	24%
Other revenues*	$124,340,306	15%
Gifts for current use	$103,225,189	13%
Rental income	$45,047,603	6%
Tuition (net)	$32,005,395	4%
Total	**$809,742,949**	

* Includes continuing medical education, publications, service income and royalties

FY 2020 OPERATING EXPENSES

Personnel costs	$316,763,812	41%
Supplies and other expenses	$225,739,497	30%
Research subcontracts and affiliates	$98,909,594	13%
Plant operations and interest	$75,882,614	10%
Depreciation	$48,611,408	6%
Total	**$765,906,925**	

HARVARD MEDICAL SCHOOL

PRODUCED BY THE HMS OFFICE OF COMMUNICATIONS AND EXTERNAL RELATIONS

Nancy Oriol

racial and ethnic disparities. Black and brown babies were dying at rates almost triple that for white infants, this in a city with some of the best medical facilities in the world. The *Globe* series was, she says, an "aha moment" for the public that cemented what she had already suspected—that obstacles to prenatal care might contribute to preterm birth, low birth weights, and infant mortality.

Oriol, who herself had grown up in a segregated, working class neighborhood in North Philadelphia that was similar to Boston's Mission Hill area, was well aware of the challenges her patients faced. "No matter who you are, fitting prenatal care into your schedule can be difficult," she says. "Imagine the difficulty when you already have children, have multiple jobs, and are four bus lines away from your obstetrician. The health care system is absolutely not set up for the working poor."

A spark ignited, and for the next few years, Oriol and Cheryl Dorsey, MD '92—then a student at HMS—hit the streets, meeting with everyone from sex workers to hospital presidents to learn what members of various communities thought might help them solve this problem. "Our work wasn't based on any formal public health principles," says Oriol. "We just asked people what they thought. It was crowdsourcing before that was a word."

This community-based design process led them to a conclusion that surprised many health care experts. They wouldn't be

delivering prenatal care—or any treatment. Instead, they proposed a mobile health unit that would build a bridge to the health care system, demystifying it through education, and priming visitors to seek care at neighborhood health centers. The mobile health unit that was proposed became the Family Van and the places it would visit were determined by community partners throughout Boston's underserved areas.

Funded in part by HMS, the Family Van offers advanced clerkship opportunities to HMS students. And, since its inception, the van's staff members have collaborated with Boston-area community health centers. At times, staff from the various community health centers join the van's team when the van is in their neighborhood. These centers, according to Oriol, recognize that the Family Van does more than remove barriers of transportation and cost; its informal curbside care also helps build trust among communities that have a history of mistrust of the mainstream health care system.

Before the COVID-19 pandemic, the Family Van followed a regular weekly route, each day at a specific location in a different neighborhood. Tuesdays, for example, brought the van to Nubian Square; Wednesdays to East Boston, and so on. "If we park in the right place, we're busy," says Oriol. "If not, we just move. This is the advantage of being mobile. If a neighborhood changes and the need for the mobile clinic changes, then we move."

Regardless of its location, patients who board the van can access a number of preventive services at no cost, including blood pressure and cholesterol checks and diabetes screenings. Education is key: The staff of community health workers, dietitians, and counselors answer questions about anything from reproductive health to depression and can connect clients to resources such as health insurance and food service assistance as well as low-cost dental and medical services. At its core, the Family Van team is about listening, educating, and referring. "You don't give up your agency when you come on the van," says Oriol. "You're driving the conversation, and we're determining how we can help you accomplish your goals."

The approach, which has been shown effective in helping to control patients' blood pressure levels and other chronic concerns, has inspired efforts across the country. There are now about two thousand mobile health units in the United States, a number Oriol expects to grow, despite, or perhaps because of, COVID-19. "Both the pandemic and the current racial justice movement have unmasked a lot of the problems in our health care system," she says. "Mobile health units work because they aren't a cookie cutter of what we think people want. They're flexible and adaptable enough to meet today's needs."

Charles Moore (above) developed the HEALing Community Center after spending time within the communities surrounding Emory University, talking with residents, and working with them to overcome the barriers preventing them from accessing quality health care.

Among and within

Moore's detours into Atlanta's underserved neighborhoods led to his own impromptu mobile health unit. As he grew to understand the obstacles to care faced by his patients, he began offering free talks and screenings for head and neck cancer out of the back of his car. Soon, he realized that his patients' other medical needs weren't being addressed and expanded his offerings to include primary care.

"Someone had told me that if these people wanted care, they would come to me," he says. "I knew that wasn't true."

Instead, Moore met patients where they were, sometimes under bridges or in drug houses—and he kept coming back, determined to earn their trust. It worked. After screening a man in a homeless shelter and discovering an early larynx cancer, he worried that the patient wouldn't be able to get himself to the hospital for treatment. But the man showed up, having walked some 15 miles. "He told me that no one had ever cared before and that he was set on getting there," Moore recalls.

Eventually, Moore found that people wanted a fixed location in their community for care. The result, the HEALing Community Center, is a federally qualified health center that provides comprehensive health care services, including oral and mental health and health education, all available to patients on a sliding payment scale. The center has

four sites throughout Atlanta, each of which is accessible by public transportation.

Moore, who now directs Emory University's Urban Health Initiative, is also looking to the future. In early 2021, he'll break ground on a housing complex, located in what he refers to as a low-wealth neighborhood, which will also offer on-site health care services, educational resources, and a community garden—an echo of Geiger's efforts to create a community-run farm co-op in 1960s Mississippi.

More for more

Growing up in Manhattan in the shadow of a large academic medical center, Elsie Taveras, an HMS professor of pediatrics at Massachusetts General Hospital, saw the effects of health inequities on members of her community. "The medical center wasn't prepared for the influx of low-income immigrant families and their health and social needs," she recalls. Like many of her peers, Taveras received much of her primary care in hospital emergency departments. "It was an early experience that stayed with me. You could see the downstream health effects of people deferring treatment and not receiving preventive care."

Those experiences spurred a lifelong commitment to addressing health disparities. "I couldn't understand how a country with so many resources like the United States still had issues of poor access to care," says Taveras. "I wanted to uncouple the relationship between poverty and adverse health outcomes."

In 2017, Taveras, then a pediatrician at Mass General, was asked to lead the hospital's Kraft Center for Community Health. At the time, the center—which had been endowed by Robert Kraft and the Kraft family to help increase access to high-quality care among underserved populations—was in transition. For the previous four years, its main focus had been on training the next generation of physicians in community health. Now, it was ready to pivot, moving to more boots-on-the-ground programs.

As its executive director, Taveras has helped guide the center into its current form, which includes work in areas that have the most common conditions that threaten at-risk populations, such as obesity, cardiovascular disease, cancer, and substance use disorder.

The center's Community Care in Reach mobile health initiative, for example, delivers addiction services, preventive care, and harm reduction resources such as syringe exchanges to four neighborhoods in Boston that have high numbers of fatal opioid overdoses. The program is the result of partnerships with the Boston Health Care for the Homeless Program, the Massachusetts Department of Public Health, and others. In just two years, the mobile unit has served thousands, providing proof that when care is easy to access, people will access it.

Taveras and her colleagues are also studying the effect of the center's community efforts. A trained epidemiologist, she's proud to bring the rigor of clinical trials to her health equity work. Indeed, in 2019, the National Cancer Institute recognized the center's work in cancer prevention with one of its Cancer Moonshot grants, funding that now supports the new Implementation Science Center for Cancer Control Equity. The Kraft Center also recently received one of the National Institutes of Health's Rapid Acceleration of Diagnostics (RADx) awards, aimed at improving COVID-19 testing in underserved communities.

Like many of her peers, Taveras received much of her primary care in hospital emergency departments.

The center's work wouldn't be possible without strong partnerships with the communities themselves, says Taveras. "We engage neighborhood associations, community health centers, and patients in everything we do. We listen and design solutions with them in mind, not just apply what we think is best." It's an approach that's helping to transform care for vulnerable populations, a long-held goal for Taveras. "Our mission speaks to exactly why I went into medicine," she says. "It's my kind of true north." HM

Jessica Cerretani is a Boston-based writer.


Elsie Taveras

Delivering mental health support to refugees and their health care providers

Body of Rights

BY LORI SHRIDHARE

Now more than ever, treating the mental health needs of the world's more vulnerable populations means integrating human rights, trauma-informed care, and advocacy. For nearly four decades, this integrated approach has been fundamental to the work of the Harvard Program in Refugee Trauma (HPRT) at Massachusetts General Hospital. Founded by Richard F. Mollica, an HMS professor of psychiatry at Mass General, the program's interdisciplinary team has developed methodologies for assessing and treating the mental health needs of refugees. It also has developed and translated training curricula for primary care physicians, mental health practitioners, and bicultural clinicians who grapple with providing care to patients whose mental health has been harmed by mass violence or natural disaster.

The tools HPRT has developed are now considered models of excellence in the field.

Today's pain

The COVID-19 pandemic has brought a new urgency to the treatment of mental health trauma within the health care profession.

According to a report released in September by National Nurses United, a registered nurses' union, more than 1,700 health care workers in this country have died from COVID-19. Although most agree that number is an underestimate, all acknowledge that the toll has been greatest among workers of color.

Compounding these losses is the racism that some health care workers are experiencing. This pandemic has seen a particular rise in racism toward Asian American health care workers, who represent more than 17 percent of physicians and nearly 10 percent of nurse practitioners in the United States. The racism and racial trauma revealed during the crisis were called out in an October 27 letter that appeared in *The Lancet*.

"The COVID-19 pandemic has not only revealed major health disparities in people of color … but also highlighted the often overlooked impact of racial trauma on health-care workers," wrote Mollica and Dinali Fernando, an associate professor in the Department of Emergency Medicine at the Icahn School of Medicine at Mount Sinai.

"Racial trauma, similar to the refugee experience, is a human rights violation," the authors continued. "Staff may need mental health counseling. We need to be cognizant that interns and residents in training might be especially vulnerable during this pandemic."

According to psychiatrists Betty Pfefferbaum of the University of Oklahoma Health Sciences Center and Carol S. North of the Division of Trauma and Disaster at the University of Texas Southwestern Medical Center, it's possible to draw parallels between the mental health disorders that may emerge following a mass tragedy and those arising from natural events such as a pandemic and to look for solutions in the best practices developed by disaster mental health professionals. In their August 6 Perspective in the *New England Journal of Medicine*, the authors wrote, "Medical conditions from natural causes such as life-threatening viral infection do not meet the current criteria for trauma required for a diagnosis of PTSD, but other psychopathology, such as depressive and anxiety disorders, may ensue."

A need defined

While the topic of human rights moved into the public discourse with the United Nations' 1948 Universal Declaration of Human Rights, it took several decades before the field of medicine, faced with waves of people fleeing war-torn and post-conflict societies and seeking asylum in this country, began to address the mental health conditions resulting from refugee trauma.

Years after his residency at Yale Medical School, Mollica developed a program that incorporated clinical care, research, education, and advocacy to serve the needs of an exploding refugee population in the United States, most of whom were asylum seekers. In 1981 he co-founded the HPRT, and since then, program staff have treated more than 10,000 survivors of torture and mass violence. They also trained hundreds of physicians who tended to those traumatized by the wars in Bosnia, Cambodia, Croatia, and Peru and who supported those who worked at Ground Zero following the 9/11 attacks.

Tread gently

Sometimes, innovation means finding solutions that simplify complexity. In assessing the mental health needs of refugees, open-ended interview questions can overwhelm or be culturally inappropriate. To remedy this, in 1993, Mollica drew upon the Hopkins Symptom Checklist to create the Harvard Trauma Questionnaire, which has since become the go-to tool for measuring the effects of torture, post-traumatic stress, and other adverse experiences on refugee health. It has been translated into thirty languages.

Applying decades of knowledge to a robust curriculum that would educate mental health professionals worldwide is the goal of HPRT's Global Mental Health: Trauma and Recovery Certificate Program, an HMS course that is part of its continuing medical education offerings on psychology and mental health. Now in its fourteenth year, the certificate program has trained more than one thousand professionals who work in eighty-five countries.

The interdisciplinary faculty hail from backgrounds in medicine, psychology, and social work and come from both within and outside of Harvard. Maria Leister, an attorney who teaches topics related to human rights, justice, and equity, took part in the program in 2015. One year later, she was invited to join the faculty and now serves on the leadership team.

In last year's on-site training in Orvieto, Italy, Leister spoke at length with program attendees seeking guidance and coaching on how to work within systems that fail large communities and populations. Employing an interdisciplinary approach that embraces the adoption of human rights both internationally and locally, she says, may open the door to a new model of caring for and empowering our most vulnerable populations. "We need to apply human rights aspirations and practices closer to home," she says. "Because it's not something that just the international community needs to implement. Our local and state communities also benefit from its careful implementation." HM

Lori Shridhare is a Boston-based writer.

A life as a physician, researcher, and administrator centered on challenging the inequities faced by Black people

On an April evening in 1952, Louis T. Wright was the guest of honor at a dinner celebrating the unveiling of the Harlem Hospital library bearing his name. Wright, MD 1915, was being lauded by none other than former first lady Eleanor Roosevelt. As she addressed the more than one thousand attendees, Roosevelt praised Wright for his relentless commitment to excellence in patient care and his unflagging fight against segregation.

Although naming the library for him might recognize these efforts, it could never begin to tell the full story of the rocky road Wright had traveled to get to that day.

Wright arrived in Boston in 1911 with his HMS acceptance in hand. But when the admissions office realized that he had not graduated from Clark University in neighboring Worcester, Massachusetts, but instead from Clark University in Atlanta, its members immediately questioned their decision. However, an interview with a leading professor at HMS removed all doubts. Wright was in—and graduated fourth in his class.

A vocal advocate for social justice, Wright missed three weeks of classes during his senior year so that he could join protests against the screening of the racist film *The Birth of a Nation*.

Blocked from an internship in Boston because of his skin color, Wright accepted one at Freedman's Hospital in Washington, D.C. While there, he proved that the Schick test for susceptibility to diphtheria worked with Black patients.

Wright's ability to innovate and conduct research continued during his tour of duty in France as part of the U.S. Army Medical Corps during World War I. There, he developed the first intradermal injection for smallpox, which lowered the risk of infection and increased the possibility of immunity compared with the traditional scratch method of inoculation.

After the war, Wright was the first Black surgeon on staff at Harlem Hospital and later was elected president of the hospital's medical board. He introduced policies that improved hospital administration, patient care, and staffing, and created a cancer center for the hospital. Wright also would be the first to test the antibiotic Aureomycin.

Just months after the library naming, Wright delivered what would be his last speech at an annual meeting of the National Association for the Advancement of Colored People, where he had served as a member of its board of directors since 1935. His "Report on the Health of the Negro" addressed five areas affecting the health of Black people in the United States: housing, education, employment, the discrimination that Black patients and professionals face when using or working in medical facilities, and the discrimination that Black students face when applying to medical schools.

Louis T. Wright

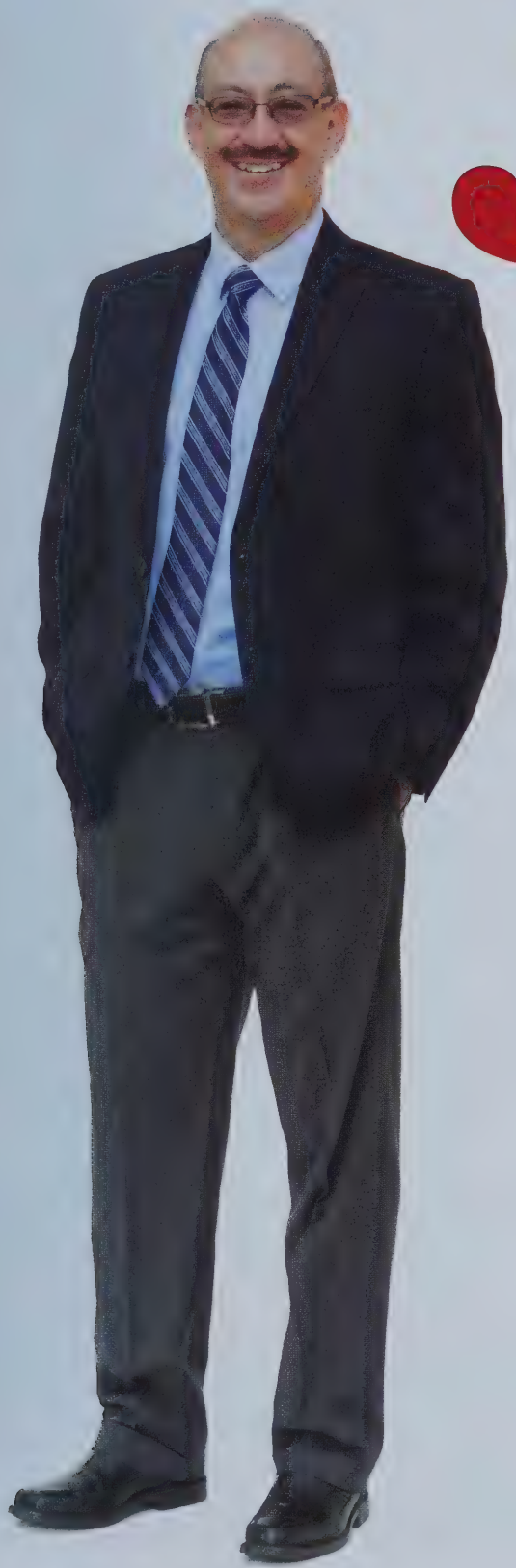
Wright died in early October 1952.

—Jessica Murphy

Jessica Murphy is the public services librarian at the Francis A. Countway Library of Medicine.

in 5

A conversation with A. Enrique Caballero, faculty director of International Innovation Programs, HMS Office for External Education; faculty director of diabetes education, HMS Postgraduate Medical Education; associate scientist, Division of Global Health Equity and HMS assistant professor of medicine, Brigham and Women's Hospital



JOHN SUARES

How do biology, environment, and social determinants intersect in disease and health?

In diabetes, obesity, and cardiovascular disease, there is no question that genetics and environmental factors play a role. We've been able to identify genes for these conditions, but genetic abnormalities cannot explain everything. My sense is that lifestyle—nutritional habits, physical activity, stress—is crucial in driving these epidemics. We often miss a key aspect of how we can help patients, which is understanding and addressing the social, cultural, emotional, and psychological factors that affect individuals. This is what I would call the art of medicine. We need to combine science and art to get closer to our patients to help them improve their lives.

What three things should the global health community do now to stem the rise in type 2 diabetes?

First, although type 2 diabetes, obesity, and cardiovascular disease can be well treated, we should aim at preventing or delaying them. Second, just telling people about prevention strategies that help improve their lifestyle—better nutrition, more physical activity—is clearly not enough. We have to address the barriers that limit their ability to implement a good meal plan and engage in physical activity. It has to do with changing systems, policies, societal values, and priorities. Third, the earlier in life we start prevention strategies, the better. We often try to work with adults who have all these conditions. That's too late. We should start early in life.

Why medicine, why endocrinology?

My parents taught me that you achieve the highest level of who you can be as a human being by doing two things every day. One is to grow and improve yourself and the other is to serve others, to put all of what you have to good use. Medicine is the perfect example of both. Endocrinology is one of the few fields in medicine that doesn't let you focus on one thing and forget the big picture. It's a system that regulates the functions of every part of your body, so you can't miss the forest for the trees. That's also my philosophy for life. We have different facets in our lives, and I believe it's important to have a balance in them all.

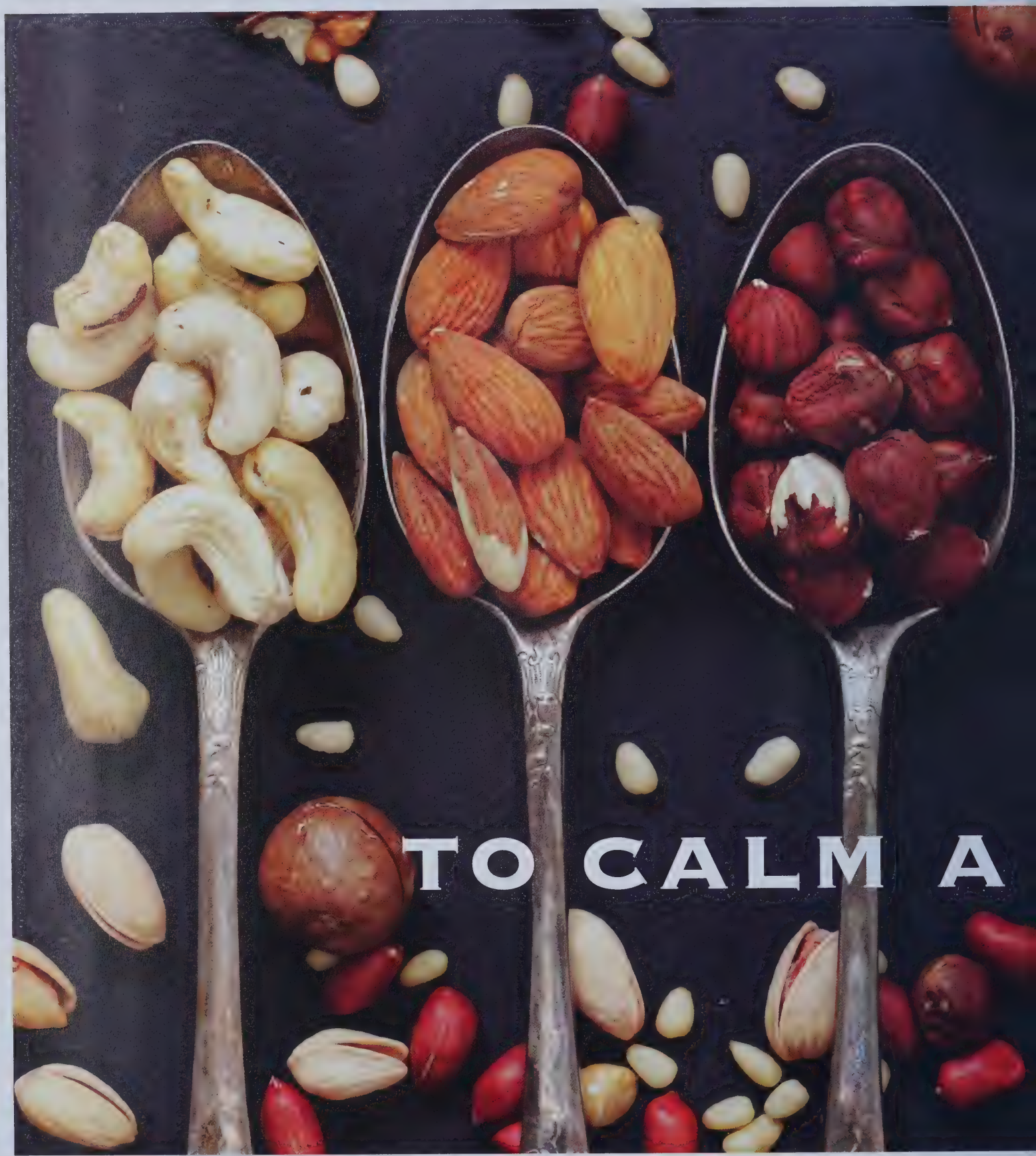
When it comes to health care, what can our nation learn from other countries?

In the United States, we're privileged to have great science and research, but unfortunately our health care system is the most expensive in the world yet without the best patient outcomes. We focus too much on trying to fix problems with science and technology, and we don't address the whole patient. I focus on health care disparities, particularly in the field of diabetes. COVID-19 has made it even more clear that inequalities exist. There's structural racism, discrimination. If we want to have a better health care system, we must first accept that these things are happening. We need to find ways to give everybody the same opportunity to enjoy a good, healthy life. Our best opportunity is to learn what other countries are doing to help people enjoy a healthy life. We need to be humble about this, right?

Who are your heroes?

My parents: extraordinary people who lived in ordinary circumstances. I was born in Mexico City. My parents were schoolteachers. They were very honest, inner-oriented people who taught me and my sister to learn things every day, to improve who we are, and to put our knowledge, experience, skills, and passion to good use for others. I now have the important mission of communicating that same message to my four daughters.

—Ekaterina Pesheva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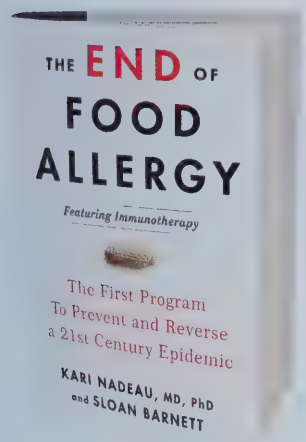


STORM

A physician-scientist teams with a journalist to illuminate the science behind food allergy

Kari Nadeau and Sloan Barnett

THE STATISTICS ARE CLEAR: food allergies have skyrocketed in the past couple of decades. One of our main sources for that assertion is the federal collection of studies known as the National Health and Nutrition Examination Survey (NHANES). According to the most recent NHANES survey, between 2007 and 2010, 6.5 percent of U.S. children were living with food allergy. That's nearly 5 million children, or 7 out of every 100. A more recent estimate by researchers at Northwestern University, led by Ruchi Gupta, puts food allergy prevalence at 7.6 percent of U.S. children. As for adults, a 2014 estimate put the prevalence among U.S. adults at about 5 percent, or about 14 million. A 2019 survey that we conducted with researchers at Northwestern of more than 40,000 U.S. adults found that nearly 4,400—11 percent—had food allergy. Applying that figure to the U.S. population as a whole means that more than 26 million U.S. adults harbor an allergy to peanuts, shellfish, dairy, or other food. And out of every 100 patients with food allergies, about 6 will be allergic to just one food but 40 will be allergic to at least two, often more. Regardless of whether you focus on the most or the least conservative figures, it's clear that food allergy is rampant in the United States. …

Having delved into the harrowing numbers and unraveled the possible explanations for the food allergy epidemic, it's time to understand how food allergy works. And that requires a trip to the microscopic world of the immune system. …

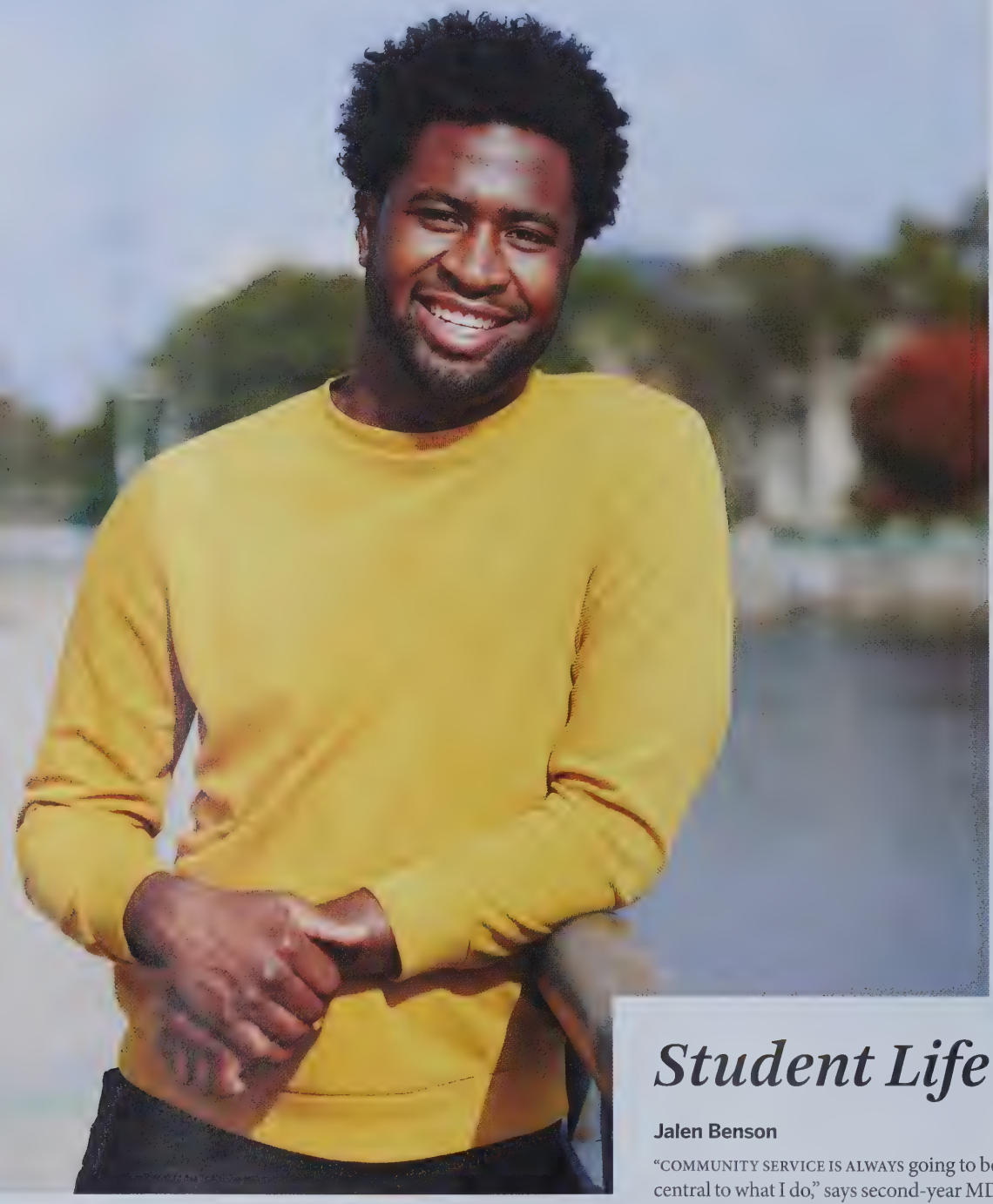
We are focusing on reactions triggered by antibodies called immunoglobulin E or IgE. Families coping with food allergy will often hear the term *IgE-mediated food allergy*. These are the most common types of food allergies and the ones responsible for the reactions we typically associate with food allergy. Food sensitivities are not the same as food allergy. … Here we are speaking about a diagnosable, testable, and dangerous immune disease called food allergy. …

IgE antibodies were discovered in the mid-1960s by two different research groups simultaneously, one in Colorado and one in Sweden. … The two groups joined forces in 1968 to persuade the scientific powers that be to officially name their mystery antibody IgE. The discovery of IgE is a defining moment in the history of allergy research. …

The thousands of studies spawned by these early findings have painted an intricate picture of how allergy works. Work by many research teams has brought this once-hidden world to light. When an allergen enters the body, IgE attaches to mast cells, which sit at the boundary between our tissues and the outside environment, as well as other types of cells. The next time the allergen appears (through a person eating the food it comes from), it encounters the mast cells with its specific IgE all over the body. That encounter coaxes the cells to release histamine; along with chemicals called cytokines, which cause inflammation; a variety of enzymes; and other compounds that contract muscles, including those governing our airways and force the body into other uncomfortable and unsafe states; all with the goal of pushing the dangerous food out of the body. The binding of IgE to mast cells and the activity that causes are at the heart of the allergic reaction that we see from the outside.

Researchers still don't know exactly why certain foods cause the immune system to produce IgE antibodies in the first place. We know that the body creates antibodies specific to each invader … The next time that invader tries to gain entry, the immune system recognizes its antigens, compounds that stand like flagpoles on its surface, and prepares to fight to the death using antibodies. But these fights are typically waged with IgG antibodies … IgE antibodies to allergens are different. They are often involved in the atopic march—eczema (or atopic dermatitis), "hay fever" (or allergic rhinitis), allergic asthma. But science hasn't gotten to the bottom of why a harmless food would be misread as an enemy in the first place. HM

Kari Nadeau, MD '93 PhD '95, is the Naddisy Foundation Professor of Pediatric Food Allergy, Immunology and Asthma at Stanford University School of Medicine and director of the Sean N. Parker Center for Allergy and Asthma Research at Stanford.



Student Life

Jalen Benson

"COMMUNITY SERVICE IS ALWAYS going to be central to what I do," says second-year MD student Jalen Benson. "These incredible institutions like Harvard have a lot of low-income—and especially Black and brown—people in their shadows who don't feel they can access state-of-the-art hospitals. A large part of the reason is historic and institutional barriers that are present today, so my goal is to minimize those barriers."

Benson knows firsthand what it's like to encounter structural racism. He was part of the largely white International Baccalaureate Program at his high school in Pensacola, Florida. More than once while waiting at a bus stop he overheard classmates' parents talking about him, saying, "What is he doing here?" or "It will ruin the quality of the education," or other hurtful statements.

Still, he says, "I was lucky. My mom raised me with the idea that life isn't fair, but if you work hard and do your best you can get what you want out of it." It didn't hurt that he and his brother were voracious readers or that he spent summers with his grandmother, who owned a flower shop, and grandfather, a "self-made man" who started out working in a junkyard but now owns a string of trailer parks and "doesn't know what a day off means."

Benson was beat on his original goal of becoming the first Black U.S. president.

"I was always going to go to Harvard law," he says. "I knew I had to leave Florida because I thought people there would always doubt me and hold me back. I wanted to be in a place where I could make mistakes without feeling pressure that I'd failed others like me."

As an undergrad at Dartmouth College, Benson majored in biology, working in biochemistry and pediatric oncology labs. Following graduation, he participated in Stanford University's thoracic surgery clinical research program but says he didn't find his niche until he worked nights as a naloxone counselor at a needle exchange in San Francisco. "It was amazing trying to cure cancer," he says, "but that wasn't allowing me to see the people I loved to work with in diverse socioeconomic situations."

Benson has been involved in mentorship programs and, as a wilderness first responder, has volunteered in rural Haiti. During the COVID-19 crisis he founded the National Student Response Network, which so far has matched around seven thousand students in the health care professions with institutions that need help during the pandemic. But he believes surgery and researching health equity are his true callings. "Surgery allows you to help someone in front of you today and research makes sure everyone who comes after them has a better and healthier experience," he says.

—Elizabeth Gehrman

KELLY DAVIDSON (THIS AND FACING PAGE)

Sarah Ahmed

BORN AND RAISED IN THE BOSTON AREA, Sarah Ahmed grew up like many other first-generation Americans—navigating two cultures. And the key to doing that successfully was education. "My parents," says this second-year medical student, "raised me with the mindset that receiving a proper education would open many doors for my future."

As a student at Quincy High School in Massachusetts, Ahmed initially was interested in the school's culinary arts program. But her participation in a science fair during her junior year changed things. "That's when science clicked for me," she says. "I understood the process and appreciated its logical approach."

She went on to major in biology at UMass Boston, where she was a member of the university's Honors College. She also participated in a three-week exchange program at Glasgow Caledonian University in Scotland that was designed to familiarize participants with the pre-med curriculum of a non-U.S. school.

After college, she joined a lab at the National Institutes of Health, where she studied the genetic causes of neurodegenerative diseases. "Although exploring the different genetic components of these diseases was fascinating," she recalls, "my favorite part was interacting with the participants in our studies."

This preference was strengthened by her childhood experience of spending summers in her parents' native Algeria, where she would often listen in on conversations between her aunts and uncles as they discussed the different medical issues that family members were having and their struggles to access proper care. "It made me want to go back and help people who don't have access to health care," she says.

Ahmed has always tried to make a difference for those who haven't had her opportunities in life. In high school, she was a peer tutor for teen moms and a volunteer in a local nursing home. College found her working as a peer mentor and tutor. Within the community, she, her sister, and some friends started a mentoring program for children at their local mosque.

Since she's been at HMS, Ahmed has worked in community clinics through the Crimson Care Collaborative, a student-faculty clinic that provides primary care service to people in the Boston area, and she is now a resident advisor in Vanderbilt Hall.

"For the longest time I thought poor health care was only happening outside the United States," she says. "But once I got involved with different aspects of my community, I realized the problems weren't only in Algeria. I think about the various scenarios that could have made my life totally different and feel I have the responsibility to be a strong voice for people who may not have the ability to be heard."

—Elizabeth Gehrman

KELLY DAVIDSON

Adam Berger

IMAGINE BEING JUST SHY OF MIDDLE SCHOOL—entering that "awkward phase" of growing up, as Adam Berger puts it—when your world shatters. Berger's parents divorced when he was in fifth grade.

Berger dealt with this sundering by focusing on school. It was, he says, the best therapy and it was available for free five days a week from September through June. "I always loved school," says Berger, a fourth-year medical student. "It was my haven to get away from everything. When the world around me became stressful, I would bury my head in my work."

Developing relationships with caring teachers who saw his potential was a real confidence builder, and when one got him into a microbiologist's lab for a high school science fair project, "that pushed me down the road to science," he says. "It made the textbooks come alive and catalyzed my love for the unknown."

Berger discovered his passion for service around the same time by volunteering at a hospital in his hometown of Olney, Maryland. "I really enjoyed talking to the patients," he says. "The amount of trust they put in me just because I had a badge was amazing."

He planned to become a physician but "caught the research bug" as a bioengineering major at the University of Maryland. The lab he worked in during a summer internship at the Naval Medical Research Center used optical imaging to take molecular fingerprints of traumatic wounds to see which healed well and which didn't, so he also "got to see the frontiers of research," he says. "What's new, what are we just learning, and what questions are still out there."

When he got to Harvard, Berger combined his interests by entering the MD-PhD program. He's not yet sure how his degrees will translate into a career, but he is sure about one thing: Whatever he does in life, it will involve helping others.

Since arriving at HMS he has become more aware of health care disparities, in part through his volunteer work with the Boston Health Care for the Homeless Program, whose clients he calls "some of the best teachers of medicine I have had." He has also learned a lot from the high school kids he mentors through the School's Health Professions Recruitment and Exposure Program. "The students' tenacity is phenomenal," he says. While he admits his path may seem "a little scattered," there is a connecting thread. "My goal is to be constantly improving. Not only improving myself, but improving the situation for others. Because I can only be *x* amount successful in life, but if I can help others to be successful, I'm really extending my reach."

—Elizabeth Gehrman

Core Values

ELIZABETH HOWELL IS THRILLED to be in her new job as chair of obstetrics and gynecology at the University of Pennsylvania Perelman School of Medicine. There, she is going to continue her life's work to reduce maternal morbidity and mortality in women of color. And there she is going to write the next chapter of her story. For that, she has some big plans.

Far-reaching plans that include setting equity goals to reduce the disparities in severe maternal morbidity and mortality and improving the quality of care for women of color, particularly Black women.

Surprisingly, this new chief of OB/GYN at a major medical school admits that OB/GYN was not her first love. But, she adds, it has been the enduring one. Early on, women's health appealed to her youthful feminist leanings, and, while working on her master in public policy at the Harvard Kennedy School, she says she became immersed in what "is now known as the social determinants of health, such as housing and education."

Howell's rotation in maternal-fetal medicine, also known as high-risk obstetrics, solidified her commitment to the discipline and, she says, "made me realize that this was a way I could combine my skills and really work in a field." For someone who fainted on her first day in the labor and delivery room, this is saying something.

Howell fondly recalls her HMS mentors during her medical student years, including William Silen, Ronald Arky, Frederick Mandell, and JudyAnn Bigby, MD '77, and she credits HMS for its student recruitment, which exposed her to what she calls peer mentors. "Even back then, Harvard was spot-on in diversity—and not just racial or ethnic diversity. I'm talking about interests, people who would push the field."

Howell has herself pushed her field in ways that have surprised her. For years she was writing journal articles and conducting research on disparities in maternal health and mortality under the radar. Then, around the time professional tennis player Serena Williams was having pregnancy complications, along comes media attention and an invitation to deliver a TEDMED Talk. She reflects on the irony, saying that "things that have the greatest potential to move the field don't necessarily get accepted at the best journals."

Howell says she knew from an early age that her career "was always going to be socially relevant, either with people or methods and data." Her parents, she says, instilled in her values of equal opportunity for all. The importance of those values is exceptionally clear today, as the COVID-19 pandemic exacts unequal tolls on Black and brown people. For Howell, this is a direct parallel to the lack of attention paid to maternal health disparities for years. These communities, she says, share a common thread: They are not listened to, not taken seriously.

Asked what she might have done if she hadn't become a physician, Howell muses that she considered becoming a civil rights attorney like her father. But she harbors no doubts about the path she chose and savors the long arc of her journey.

—*Susan Karcz*

Elizabeth Howell, MD '93 | head of OB/GYN at Penn Medicine | chair of the Department of Obstetrics and Gynecology at the Perelman School of Medicine at the University of Pennsylvania

André Churchwell, shown here on the Vanderbilt University campus, is a member of a family whose accomplishments are many, as attested to by the portraits, diplomas, and other memorabilia that graced his childhood home (facing page).

The **Journey** to Here

A physician reflects on race, racism, and the power of family

by André Churchwell

ABIGAIL BOBO (FACING PAGE); COURTESY OF THE CHURCHWELL FAMILY

I HAVE BEEN ASKED TO PEN A FEW WORDS AND THOUGHTS about racism from my vantage point as a Harvard Medical School student of the class of 1979. My story will certainly stir the memories of folks of a certain age and vintage, and to complete it, I will include reflections on my family and their role in this story.

I arrived in Beantown late in the summer of 1975 to start my four years at HMS. Having never left the South nor traveled any distance from my native city of Nashville, Tennessee, I arrived in Boston with my father, Robert. The two of us cautiously maneuvered through the chaos of Logan Airport, and, after securing a taxi, were whisked to Roxbury by an apparent NASCAR cab driver. Although the driver offered us many unsettling examples of what a car should *not* do when on a street or highway, with the Lord's help, we made it to 107 Avenue Louis Pasteur and the front door of Vanderbilt Hall.

Before my arrival, I knew of contentious debates regarding Boston public school integration. A mere few years earlier in Nashville we'd had our own incendiary and divisive polemics over school integration. But my naïve understanding of the liberal values of the Boston populace led me to believe that the discussions in Massachusetts would be wholly different from those in Tennessee.

Boy. Was I wrong.

Words that chill

After a few months of living in Boston, it was clear to me that Nashville and the South, in general, had no monopoly on racial inequities or morbid institutional practices designed to subjugate African Americans.

Further shocks occurred over the years. One, in 1976, was particularly eye-opening for me.

That year, Bernard Davis, MD '40, a professor of medicine at HMS, published a piece in the *New England Journal of Medicine* that was worthy of the writing of the segregationist and former governor of Alabama, George Wallace. In the article, "Academic Standards in Medical Schools," Davis wrote that minority students at HMS were not fit to occupy the places in their classes and that more worthy students should fill their seats.

Davis' insult was felt by all of us who were nontraditional students at the long white, and male, HMS—or by anyone who cared about equity in medicine or life. But the next story I'm about to tell is personal. I pause to question if I should share it, but I feel I must: It's essential to understanding the layers of prejudice Boston offered—and the fears I experienced because of them.

It was in Boston that the greatest threat ever to my life occurred. It happened during an annual St. Patrick's Day celebration. I was in my final year at HMS and was just ending a day of my clinical rotation at Massachusetts General Hospital. It had been a typical day and, as usual, I headed for the T station to catch a Red Line train.

I was standing on the platform when what seemed like a bad dream unfolded.

A group of youths, all drunk with green beer and yelling insults inflected with what sounded like South Boston accents, decided that the sight of me, a young Black man in a short white coat carrying a

Racial unrest shook Boston in the mid-1970s as residents from South Boston, or "Southie" (shown here), and elsewhere took to the streets to voice their opposition to the implementation of an initiative to integrate the city's public schools. Angry clashes also erupted on Carson Beach (above, center) and other beaches in South Boston in response to efforts by Black people to use the public spaces.

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DO NOT WRITE BELOW THIS LINE

Kevin Churchwell

doctor's bag, was unbearable. I've always wondered if the sight of me was too much for their fragile self-esteem or self-image to bear, but whatever their reasons, they came after me with evil intent. They were out for blood. My blood.

Cursing and staggering, they chased me out of the train station and all the way over to and down Huntington Avenue, where I sprinted next to a moving Green Line train. Thankfully, stimulated by my will to live, my adrenal glands propelled me ahead of them to Vanderbilt Hall's front door and the safe shelter within. This occurred only once, but it seared itself permanently in my memory. I never told my parents about this incident—I didn't want to worry them. But the pain and anger I felt then are still there.

I feel them as I write this.

Words to empower

It was from such humiliations that I came to realize that Boston, the widely touted cradle of liberal values, was deeply embedded with racist practices and racist individuals who would seek to do me and other students of color harm. My only solace came when I witnessed professors and fellow students standing with us as we denounced these despicable ideas and heinous actions.

My father's teachings and wise admonitions compelled me to seek out fellow students and faculty who had a moral conscience and convictions similar to mine. Dad had informed me that such individuals did exist and that they would help me and my fellow students find solutions—emotional support and intrapersonal strength—during those trying, turbulent, and dangerous times.

As usual, Dad was correct. I met lifelong friends whose journeys did not include being African American but whose families faced similar challenges. Such was the case for Harold Bursztajn, MD '77, a Jewish "brother" whose parents, as members of the resistance in Nazi-ravaged Poland, met and married in the sewers of the Lodz ghetto, and for Matthew Movsesian, MD '78, a native New Yorker of Armenian descent who never lost his outrage over the Turkish-led genocide of nearly two million Armenians in the early 1900s. These friends understood prejudice in all its malevolent shapes and forms. HMS neurobiologists and teachers David Potter, PhD '56, and Edwin Furshpan also supported us; they equally deplored the thoughts and writings that Davis had published. As I developed a large collection of multicultural friends, it became apparent to me that the fight for moral freedom and social justice transcended skin color or a person's state or country of origin.

Cursing and staggering, they chased me out of the train station and all the way over to and down Huntington Avenue, where I sprinted next to a moving Green Line train.

I suspect it is from such fiery crucibles of intense prejudice and racism, whether they be in Nashville or Boston, that a person becomes emboldened to develop programs to foster equity, diversity, and inclusion—as I did in my early career at Emory University and as I now do at Vanderbilt University.

Words for success

My will to learn, explore, and, thankfully, survive came from my parents, Robert and Mary. Dad, a journalist, and Mom, a first-grade schoolteacher, raised five children in a 2,000 square-foot home. Parental rules allowed us to play football in the street but required baseball and softball be played in the alley so as to minimize—but unfortunately not eliminate—damage to neighbors' cars or windows.

Although there is no record of there being physicians in our extended family, three of us chose careers in medicine. I led the way, first to Vanderbilt, then to HMS, and finally to Emory for residency and cardiology training. Eight years my junior, my twin brothers, Kevin and Keith, guided by providence or serendipity, began their

journeys to medical careers. Kevin attended MIT then Vanderbilt for medical school and obtained his training in pediatrics at Boston Children's Hospital. Keith attended Harvard College then Washington University School of Medicine and finally Emory, like his older brother, for his residency and cardiology fellowship.

What natural forces compelled three young African American men from a southern African American middle-class family to choose careers in medicine? Furthermore, who would have guessed that along the way the education of these three men would connect to both Harvard and Vanderbilt? Or that their careers would intersect? We were a trio on the faculty at Vanderbilt for 15 years.

Anyone who knew our parents would know the answers to those questions. Both played key roles in our upbringing. Mother was the chief financial officer and chief operating officer who found funds—only the angels knew where—to pay for our education and that of our other two siblings, who also attended college. Dad served as the wise counsel. He offered us daily lessons of subtle moral instruction and of a virtuous life, which he modeled for us.

On Saturdays, while we were on all fours hand waxing the floors of our home, he would turn on our RCA Victrola and infuse our curious minds and ears with the music of Beethoven, Mozart's *Don Giovanni,* and, of course, Ella Fitzgerald and Frank Sinatra. In his library, the largest room in our house and the only one with an air conditioner, he presented us with the words of Langston Hughes, Ernest Hemingway, and other writers to "teleport" our minds from our home on North Ninth Street to a street corner in Harlem or a bullring in Madrid.

The parental challenge to eradicate racial inequities remains with us, and our parents' message of service will continue to compel us.

Along with physical labor on Saturday mornings, he submitted teachings and admonitions daily at our dinner table, each inculcated with his seminal message of service to all. From his lessons, he set us on our paths from THERE to HERE.

I doubt a day passes when, gazing at a picture of our late parents, I don't reflect on some lesson, whether it be spiritual, musical, or humorous in nature, that they left us. Now, from their heavenly perch, they witness us rise—though not as early as Dad's 4:30 a.m. habit (but close)—to begin our days.

Kevin is now the president and COO of Boston Children's, a Harvard-affiliated hospital. Keith is the newly minted president of Yale New Haven Hospital. And I, the older brother, am the vice chancellor of equity, diversity, and inclusion and the chief diversity officer for Vanderbilt University and the chief diversity officer for Vanderbilt University Medical Center.

I think Dad would agree: We got from there to here.

The parental challenge to eradicate racial inequities remains with us, and our parents' message of service will continue to compel us, like Sisyphus, to put our shoulders to the boulder of racial inequities, health disparities, and inequitable patient care and push uphill toward change each day. And as we push, we are armed with their memories and life purpose.

Keith Churchwell

STEVEN SMITH

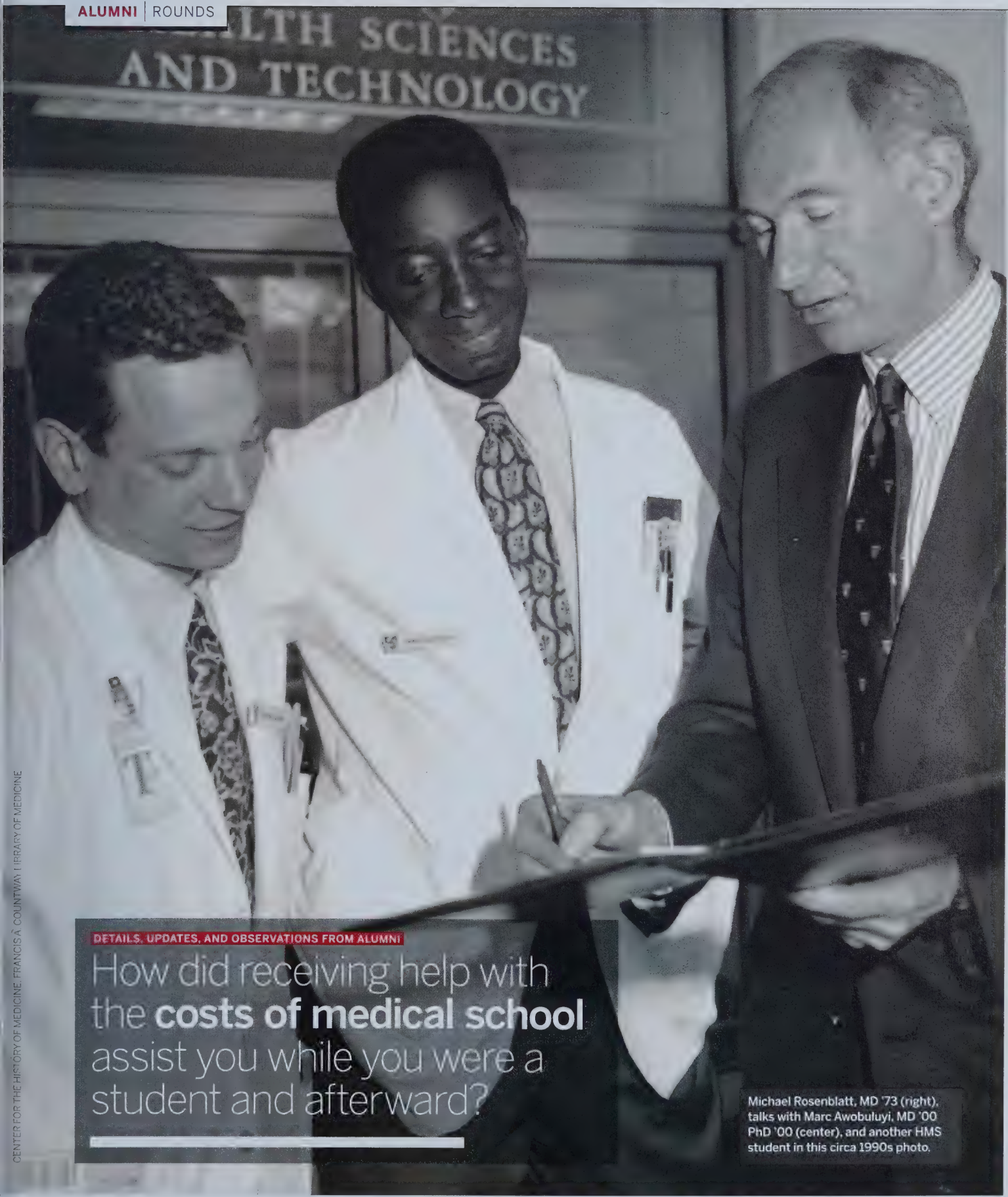
Words of tribute

A few years after Dad passed, I wrote a piece for our local newspaper, *The Tennessean*. Although the words were written as a Father's Day tribute to him, what they say could apply to Mom, too.

He is gone now, like Pompeii.
He was as wise as Erasmus until the last second. His lessons etched in the son's soul.
A long life and many lessons shared.
He was not selective; his wisdom and love were freely dispensed.
No physical monument for him but progeny with his name and humor who seek to preserve the memory of his grace and who recite his intensely unique journey.
His legacy is that mercy, love, and service must be taught; shared and perpetuated.
For him this was the meaning and purpose of a complete life.

The Churchwell children remain thankful for lessons bestowed by Mom and Dad. HM

André Churchwell, MD '79, is vice chancellor of equity, diversity, and inclusion and chief diversity officer for Vanderbilt University and chief diversity officer for Vanderbilt University Medical Center.



DETAILS, UPDATES, AND OBSERVATIONS FROM ALUMNI

How did receiving help with the **costs of medical school** assist you while you were a student and afterward?

Michael Rosenblatt, MD '73 (right), talks with Marc Awobuluyi, MD '00 PhD '00 (center), and another HMS student in this circa 1990s photo.

CENTER FOR THE HISTORY OF MEDICINE, FRANCIS A. COUNTWAY LIBRARY OF MEDICINE

"I am extremely fortunate to have received generous financial aid and to graduate with only a small amount of debt. It granted me the freedom to pursue my clinical passion in pediatrics, typically a low-paying field."

Laurie Green, MD '76

Knowing I could choose my specialty based upon excitement and aptitude rather than income mattered greatly.

George Lewinnek, MD '67

I had no help during medical school. (Thank you, Dad, for paying my way.) By the time I was a resident I had the GI bill, and that permitted me to support a family without moonlighting. One of my resident mates was secretly moonlighting and it was brutal for him.

Bob Snodgrass, MD '63

I didn't receive financial aid. I was married at the end of the first year. My wife worked and covered most of our expenses.

Mary Flowers, MD '78

I was sued by Harvard for student loans when I was working in their program as a fellow and only making $12,000 a year. It ruined my credit for years.

Richard Burney, MD '69

Are you kidding? I was completely dependent on financial aid throughout medical school. Fortunately, in those days, interest rates were very low, interest did not accrue, and no repayment was required until after you had completed residency and your military obligation. After that, I was able to pay off the loans over 17 years without facing the kind of oppressive debt burden students are dealing with today. Loans in those days were designed to benefit students, not banks.

Kathy Glatter, MD '93

I never got any financial aid for college or medical school. My father, Tom Glatter, is a retired cardiologist who worked his entire career serving indigent patients. My grandparents were immigrants with no money, although my grandfather worked as a psychiatrist at a state psychiatric hospital. My dad put himself through college and medical school by selling his blood (he is AB negative) and playing piano in bars.

Don Dickerson, MD '57

I was able to borrow from Harvard at very low rates. Scholarships and grants were few or none at all.

Priscilla Slanetz, MD '91

I was fortunate to be part of the Health Sciences and Technology program. By participating in the research assistantship program, nearly half of my tuition was covered, making my education much more affordable. But given how expensive medical education has become today, every student needs financial support. It is not realistic to expect parents to pay full tuition for both college and graduate education for their children, as it will leave most unable to ever retire.

Sheila Hafter Gray, MD '58

It lessened the burden on my parents, who used their retirement funds for my tuition.

Edmund Lee, MD '96

The Massachusetts Medical Society had a nice loan program with generous terms. After graduating residency, I took a fellowship at The Rockefeller University. Coincidentally, the National Institutes of Health began a medical school loan assistance program that helped me pay back my loans during my fellowship. I hope it still exists.

Kara Wong Ramsey, MD '09

I am extremely fortunate to have received generous financial aid and to graduate with only a small amount of debt, which I paid off during my first year of residency. It granted me the freedom to pursue my clinical passion in pediatrics, typically a low-paying field compared to others, without concern about financial implications. It also granted me the freedom to decide to practice medicine back home in Hawaii, despite the high cost of living and relatively lower pay for medical professionals.

Leen Al Kassab, now a fourth-year medical student, received the HMS Gerald S. Foster Scholarship in 2018 from Foster, MD '51, himself. The scholarship is awarded annually to one incoming HMS student based on academic excellence and a demonstrated commitment to public service.

George Hill, MD '57

I could not have been a student at HMS without a scholarship and employment opportunities that were suggested to me by the registrar, the unforgettable Dorothy "Dottie" Murphy. She found part-time work for me during my first two years. I came out debt-free and was able to choose to do the right things afterward, instead of trying to repay loans.

Sallie Permar, MD '04

I benefited from the NIH Loan Repayment Program for physician-scientists to pay off my medical school loans, beginning on an integrated research pathway in my pediatric residency. This loan repayment program was life-changing for me and allowed me to focus on a research career. We need more programs like this to grow and diversify the pool of next generation physician-scientists.

Deborah German, MD '76

I was fortunate to receive a full scholarship, tuition, living expenses, and spending money for four years from the Charles Smith Bequest. It changed my life. At HMS, I never worried about whether I would have enough to eat and later I was always able to do what I loved. Without debt, the salary was never a driving force. Later in life, as the founding dean of a new medical school, I raised funds so that every student in the charter class had a full scholarship like mine. It was a chance to give back.

"Receiving financial aid, including Loans for Disadvantaged Students, was a gift the scope and value of which gained clarity over time."

Laura Holmes, MD '83

Receiving financial aid lifted a huge burden off my parents' shoulders, as they had no resources to help me pursue my dream. Later, after residency, I was able to take a job back in my hometown, helping folks in my community rather than focusing on the financial implications of my decision. It allowed me to put the people I cared about first.

David R. Brown, MD '71

Receiving financial aid was invaluable. Without assistance, it is unlikely that I'd have been able to attend med school. I was married and had a child at the time and meeting expenses was possible only because of the assistance I received.

Kenneth Gundle, MD '10

Receiving financial aid, including Loans for Disadvantaged Students, was a gift the scope and value of which gained clarity over time. Having those loans at zero percent interest during school and residency not only saved money, it let me focus on my training. Along with several classmates, I eventually found the White Coat Investor and developed financial literacy. HMS financial aid is quite unique! I'm just a few months from paying it off, and grateful. I'm looking forward to continuing to pay it forward!

Carol Vasconcellos, MD '79

Thankfully, I did receive help with the cost of medical school, but not from HMS. After receiving no offer of financial aid, I made an appointment with the office but was told I did not qualify for the aid programs they had available. Fortunately, the U.S. Air Force viewed me differently; my scholarship and subsequent service left me eternally grateful to the military, and yes, to Harvard for an exceptional education that extended far beyond the merely medical.

Peter M. Zawadsky Jr., MD '68

The financial assistance enabled me to incur a manageable debt which I was able to pay off in about five years.

John D. Bullock, MD '68

The student money from HMS was critical! That's why I established a monetary award for an HMS student going into ophthalmology, the John D. Bullock Ophthalmology Award. I am still most grateful. After internship, the U.S. Navy, and residency, we were "rolling in it" because my wife worked when I was an intern and I moonlighted while in the Navy and made enough that I did not have to work outside as a resident in ophthalmology: I could devote all my time to learning and research.

Thanks to all who shared recollections on the role of financial aid during, and after, their time at HMS.

The next issue of Harvard Medicine *will carry your responses to the question: When medical students care for their first patient, the experience can be memorable.* ***What do you remember about your first patient encounter?***

Responses can be submitted online: ***hms.harvard.edu/rounds****; via email: hmsalum@hms.harvard.edu; by phone: 617-384-8520; or by mail: Rounds, Alumni Affairs and Development, Harvard Medical School, 401 Park Drive, Suite 505, Boston, MA 02215.*

Obituaries

1940s

1941

Herbert Tabor, MD
August 20, 2020

1945

Joseph M. Miller, MD
September 5, 2020

1946

Horace B. Barlow, MD
July 5, 2020

1949

Raquel E. Cohen, MD
October 21, 2020

1950s

1950

Leonard Laster, MD
October 24, 2020

Alexander R. Margulis, MD
September 7, 2018

1951

William H. Danforth, MD
September 16, 2020

Willard B. Fernald, MD
September 15, 2020

Gerald S. Foster, MD
November 3, 2020

1953

Julian I. Kitay, MD
July 1, 2020

1954

Richard Umansky, MD
July 14, 2020

1955

Ernest H. Picard, MD
August 10, 2020

Robert B. Sirkin, MD
September 14, 2020

1956

Kirby K. Bryant Jr., MD
September 20, 2020

1957

G. C. Oliver Jr., MD
November 5, 2020

Howard S. Rubenstein, MD
September 20, 2020

John W. Singleton, MD
February 3, 2020

George M. Williams, MD
August 26, 2020

1958

Anita M. Herald, MD
August 2, 2020

1959

Norman O. Aarestad, MD
February 7, 2020

Anne M. Haywood, MD
August 2, 2020

1960s

1960

Stephen L. Reynolds, MD
September 23, 2020

1961

Michael Lane, MD
October 21, 2020

John F. Wilber, MD
July 25, 2020

1962

Catherine M. Wilfert, MD
September 13, 2020

1963

Paul Edward Baronowsky, PhD
October 26, 2020

Harvey Klein, MD
August 12, 2020

1965

Dennis E. Niewoehner, MD
August 31, 2020

Eugene B. Rosenberg, MD
July 20, 2020

1968

Frederick A. Jakobiec, MD
November 14, 2020

1969

Donald J. Krogstad, MD
August 14, 2020

1970s

1970

James H. Tenney, MD
March 12, 2012

1974

William C. Scott III, MD
May 31, 2020

1990s

1996

Benjamin L. Sapers, MD
August 4, 2020

1999

Jason Adam Kahana, PhD
July 31, 2020

2000s

2004

Eric S. Williams, MD
October 15, 2020

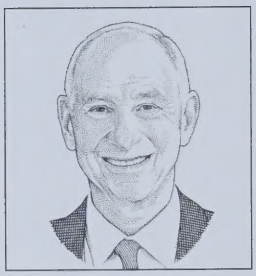
2017

Alisha V. Ling, MD, PhD '15
January 14, 2020

This listing of deceased alumni includes those whose notices of death were received between August 1 and November 20, 2020.

PRESIDENT'S REPORT

Our **Continued Commitment** to Our Students and to HMS



BY NOW WE'VE ADAPTED TO LIFE IN A PANDEMIC. I hope that, along with challenge and loss, there have been unexpected bright spots for you—and perhaps the feeling that there is a light at the end of the tunnel.

More than one crisis is underway. In addition to the pandemic, there is an economic meltdown and the pressing issue of racial injustice.

Dean George Q. Daley's leadership team is addressing these crises for the HMS community thoughtfully. At the October Alumni Council meeting, Daley, MD '91, briefed members of the Council who attended. He reported that HMS students had developed a COVID-19 curriculum being used in more than one hundred countries. Locally, HMS is leading a multi-institutional collaboration, the Massachusetts Consortium on Pathogen Readiness, that aims to address the current and any future pandemics. More than sixty projects have been funded through MassCPR by grants totaling over $17 million.

Daley also told the Council that HMS has established an anti-racism task force focused on promoting a more diverse, inclusive, and respectful community at the School. Progress on this effort will be monitored and measured using several parameters.

Not surprisingly, the COVID-19 pandemic hit the finances of the School just as HMS was on the cusp of eliminating a 10-year structural deficit. A new operating plan has been generated to reduce expenses while still making key strategic investments in diversity, education, and science.

The Alumni Council renews perennially. The Slate Committee, led this year by Ted Kohler, MD '76, is systematically analyzing alumni demographics to make sure that the composition of the Council will be balanced in its representation of the alumni community.

Erik Gaensler, MD '84, chair of alumni giving, has established new approaches to foster alumni engagement and giving that have yielded strong results despite the economic upset triggered by the pandemic.

The centerpiece of the Council's efforts remains the initiative to make education debt-free for our medical students who have financial need. The Council reaffirmed its unanimous vote to pursue and prioritize this goal, which is admittedly aspirational; success will take time and sustained support from alumni. One means to achieve a short-term effect is to support the REACH Scholarship Program. REACH, which stands for Resilience, Excellence, Achievement, Compassion, and commitment to Helping the underserved, has an impressive record of recruiting students from backgrounds underrepresented in medicine. The program depends on philanthropy, which has come from HMS alumni and faculty. But the need for support for this and other programs that can help reduce student debt, and keep our recruitment efforts competitive, remains. To help support these efforts for the longer term, alumni can make bequests to the financial aid endowment.

For the debt-free initiative to succeed, it's clear that HMS also will need to attract philanthropy from beyond the alumni community. Therefore, the Council was pleased to learn from Lisa Boudreau, dean for alumni affairs and development, that the University is helping to identify potential donors outside HMS.

I remind you that suggestions from our fellow alumni are welcome, and I hope that 2021 brings you peace and joy.

Michael Rosenblatt, MD '73, is senior partner at Flagship Pioneering in Cambridge, Massachusetts.

Alumni Announcements

Journeys: White Coat to 'What Now?'

As part of its commitment to pursue a debt-free medical education for our students, the HMS Alumni Council is hosting a series of regional webinars about the debt crisis facing so many medical students and the effects that this financial strain has placed on them. In each webinar, a current student and alumni from around the country will share their experiences at HMS and beyond and discuss how financial aid and student debt have affected their career choices. Learn more about the series at **alumni.hms.harvard.edu/journeys.**

Alumni Day and Reunion

Alumni are invited to participate in special activities as part of Alumni Day. In 2021, alumni from class years ending in 1 or 6 can reconnect with classmates from June 3 to 5. While we hope the celebrations can take place in person, our community's health, safety, and well-being are our top priorities. Harvard continues to monitor the coronavirus pandemic and is planning several reopening phases to limit the spread of COVID-19. For the latest updates on Alumni Day and the 2021 reunion, visit **alumni.hms.harvard.edu/alumni-day** or **alumni.hms.harvard.edu/reunion.**

Harvard Online Courses

Never stop learning. As an HMS graduate, you can take advantage of an array of free and fee-based online courses to help advance your career or pursue your passions. Select from categories spanning topics from health and medicine to business and social sciences. Learn more at **online-learning.harvard.edu/catalog.**

Don't Miss Out

We want to keep you informed on networking and professional events, exclusive alumni benefits, invitations, reunion notices, and the latest HMS news. The majority of our communications are sent via email, so make sure your information is up to date at **alumni.hms.harvard.edu/email-update.**

Distinguished Service Award for HMS Alumni

The winner of the 2021 award, which recognizes and celebrates individuals who have demonstrated loyalty, service, and commitment to HMS, will be announced during the Alumni Day and reunion programs, June 3 to 5. Learn more about the award and nominate a fellow alumna/us at **alumni.hms.harvard.edu/service-award.**

BEQUESTS | LEAVE A LEGACY

HARVARD MEDICAL SCHOOL

WHAT WILL BE YOUR LEGACY?

Consider investing in longer, healthier lives

A gift to Harvard Medical School through your will or trust is one of the simplest ways to leave a legacy. You can give cash or a specific asset such as real estate or personal property.

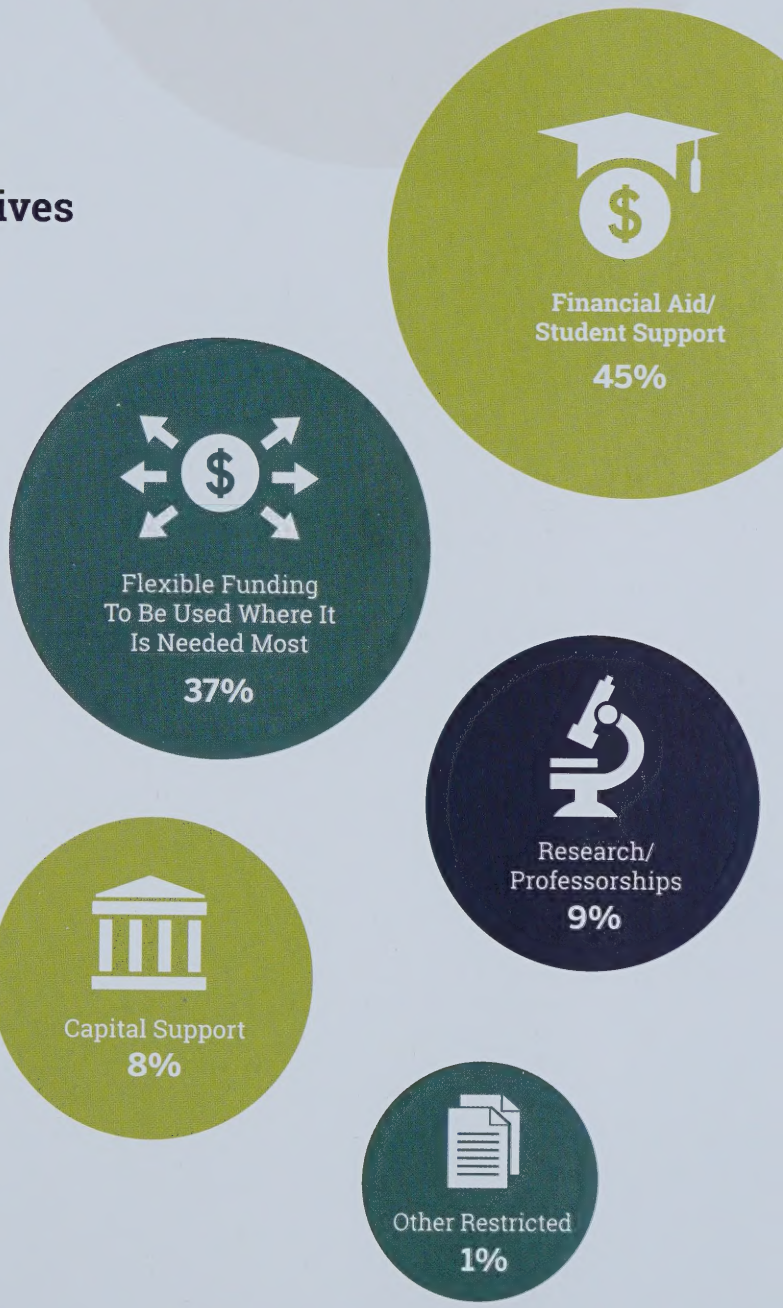
Bequest gifts of any size have had a lasting and powerful impact on the School, combining to provide more than $43 million in the past decade to alleviate suffering and improve health and well-being for all.

Benefits

- Fulfill your financial, tax, and estate planning goals
- Reduce or eliminate estate tax
- Improve health and well-being for all
- Create enduring impact at Harvard

Bequests

Since 2011, realized bequests have supported these key areas:



Learn more at
hms.harvard.edu/bequests

Or contact us in confidence:
Kate Murphy
1-800-922-1782
giftplanning@hms.harvard.edu

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TRACI DABERKO

A tough time for kids

The mental health of Black children has been pummeled this year as the racial injustice and strife that has filled our streets heightened their worries over their own safety and the safety of those they love.